REMOVAL ACTION WORKPLAN (RAW)
SESI PROPERTY CLOSURE REPORT
OTAY MESA, SAN DIEGO
CALIFORNIA

Prepared For:

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1.0 INTRODUCTION

This document presents the Removal Action Workplan (RAW) for the Sesi Property (Site), located on Cactus Road, San Diego, California (Figure 1-1). The RAW was prepared by ENV America Incorporated (ENV America) for the Coordinating Committee, appointed by the United Sates District Court for the Sesi Property. The Sesi Property includes a portion of the former Tripp Salvage Landfill, which accepted auto-shredder wastes and burn dump ash. The RAW was prepared under Health and Safety Code (HSC) Chapter 6.8 §25356.1(h)(1), as of August 2001. The RAW was developed to carry out a removal action which provides for the protection of human health and safety, and the environment. Removal actions refer to cleanup and/or other measures to prevent, minimize, or mitigate the affects of the hazardous substances release (HSC §25325).

The RAW includes: 1) an adequate characterization of the hazardous substances at the Sesi Property; 2) a detailed engineering plan for conducting a removal action; 3) a Health and Safety plan for implementation of the engineering plan; and, 4) a discussion of alternative methods which were considered and screened, and justification for the selected method.

1.1 Background and Sesi Property Description

ENV America Incorporated (ENV America) was appointed as the "construction management team and remediation contractor" for the Sesi Property by the United States District Court (the Court) on August 12, 1994. This project was undertaken on behalf of the Court, in association with the case "Sesi, et. al., v. Signal Landmark" (Case Number. 91-1057-B [AJB]), and performed under the supervision of the Court-appointed "Coordinating Committee." This report presents ENV America's RAW for the Sesi Property.

The following is a summary of the general information regarding the Sesi Property:

Site:	Sesi Property (formerly part of Tripp Salvage) Cactus Road, Otay Mesa Area, City of San Diego San Diego County, California
Site Legal Description:	Assessor Parcel Nos. 646-100-49, 646-100-59 and 646-100-70

Property Owners Representative:	Mr. and Mrs. Salim D. Sesi 1415 Coker Way El Cajon, California 92021 (619-588-7882)

For a complete list of owners, see Section 16.2.

Court:	The Honorable Anthony J. Battaglia, U.S. Magistrate Judge United States District Court, Southern District of California 940 Front Street San Diego, California 92189 (619-557-3446)

Coordinating Committee:	Richard G. Opper, Esq. Opper & Varco LLP 225 Broadway Suite 1900 San Diego, CA 92101 619-231-5858	Ms. Sandra Sciutto Sr. V.P., & CFO Signal Landmark 6 Executive Circle, #250 Irvine, CA 92614 949-250-7700

The Site is situated approximately 15 miles southeast of downtown San Diego, and about 1.25 miles north of the United States-Mexico International Border. The regional site location is identified on Figure 1-1 - Site Vicinity Map. The Site lies on the westerly side of Cactus Road, between Otay Mesa Road and Airway Road, in the Otay Mesa area. The Otay Mesa area is sparsely developed, the most notable manmade feature is Brown Field, a municipal airport located about 1,500 feet north-northeast of the Site. The Site location is shown on Figure 1-2 - Site Location Map.

The Otay Mesa (the mesa) is a plateau with relatively mild topographic relief sloping to the west-southwest. The mesa is locally dissected by natural drainage courses, principally draining westward to the Pacific Ocean. The Site exists at the head of Spring Canyon, a tributary of the Tijuana River.

The waste fill occupies the Site as well as properties to the north and south (see Figure 1-3 - Site Plan). This RAW is limited to the Sesi Property only. A separate remedial action, consisting of an asphalt concrete cap, was implemented for the Barnhart and Dantzler properties to the north of the Site. Based on available data, including a historical topographic map, the two properties located south of the Sesi Property may have also been subjected to construction activities and placement of waste fill material. No known field investigation has been conducted by the owners of these two southerly properties or other parties to verify the nature of the fill material. As these two southerly properties are not owned by the Sesi Group, remedial actions for them are not considered herein.

The estimated limits of the landfilled waste within the Sesi Property and site topography are presented on Figure 1-3 - Site Plan. The limits of the landfilled waste were based on field mapping and subsurface exploration within the Sesi Property, and by comparison of pre-waste disposal ground surface contours as shown on Figure 1-4 - Pre-Landfilling Topography, with present contours shown on Figure 1-3. The southwestern limits of waste are well constrained by remaining upper portions of the former canyon slopes and by exploratory trenching at the toe of the fill slope. The northwestern limit of waste is not as well bounded by topography. However, this limit is defined by exploratory trenching as presented in Section 2 of this report. The area of the Site now occupied by waste was formerly an eastward extension of Spring Canyon. The filled canyon was approximately 45 feet deep.

The Sesi Property encompasses an area of about 33.25 acres, and is irregular in plan view. Waste on the Site covers about 4.1 acres. At the time of this writing, the Sesi Property is partially fenced and essentially vacant land. Topographic relief is generally described as mildly sloping to the west-southwest, except along the walls of Spring Canyon where topography is steep. The area of landfilled waste is covered with sparse to moderately-thick annual grasses and weeds. The canyon bottom is host to denser phreatophyte vegetation and scattered trees.

The overall relief of the immediate area of the waste fill is approximately 65 feet, with maximum elevation of about 495 feet at the easterly limits along Cactus Road, and a minimum elevation of about 430 feet in the canyon bottom at the western end of the waste fill slope. Overall surface drainage in the area is generally to the west.

1.2 Site History

1.2.1 Period 1968 to 1980

Available records indicate that Mr. Fred L. Tripp formerly operated Tripp Salvage at the Sesi and Dantzler properties. The Tripp Landfill operated under a "Rubbish Dump Permit" issued by the State of California, Department of Conservation, Division of Forestry, accepting wastes from approximately 1968 to 1977. Accepted wastes primarily consisted of material from the processing and shredding of automobiles (auto-shredder waste). The auto shredder waste was placed in Spring Canyon, and intermittently covered with soil generated from onsite cuts. The cut/borrow areas were the walls of Spring Canyon, immediately downstream from the landfilling operation. The total volume of auto shredder waste emplaced at the Sesi Property has been estimated by various parties as shown on Table 1-1 - Waste Quantity Estimates - Sesi Property.

According to Environmental Analysis and Valuation, Inc. (EAV), from about 1977 to about 1980, approximately 42,000 cubic yards of additional fill were placed over the auto-shredder waste (EAV, 1991). The additional fill mainly consisted of soil that was again generated from onsite cuts, and combined with some construction debris.

1.2.2 Activities from 1981 to June 1987

According to EAV (EAV, 1991), from about 1981 to June 1987, there was no evidence of substantial changes in the area of fill at the Site.

1.2.3 Period June 1987 to July 1987

Between June and July of 1987 burn dump ash (ash) waste was placed at the Site (EAV, 1991). The ash reportedly originated from the former Rancho Carillo Municipal Landfill in Coronado, California. According to Applied Geoscience Inc. (Applied), the ash was transported to Spring Canyon and disposed by Signal Landmark's independent contractors (Applied, 1991). Estimated quantities of ash placed on the Sesi Property are shown on Table 1-1.

1.3 Site Use and Surrounding Land Use

The Sesi Property is essentially vacant, undeveloped land. Historically, the general site area has been used primarily for agriculture. Currently, nearby properties are used for industrial, agricultural and residential purposes. The adjacent Dantzler property is occupied by a rural-type house and sheds. A large tomato farm exists on the eastern side of Cactus Road.

Caltrans proposes to extend State Route 905 (SR-905) from the Interstate 805 (I-805) area west of the Site to the Otay Mesa International Border Crossing east of the Site (Caltrans, 2004).

The southern edge of the freeway Right of Way is planned to be approximately 200 feet north of the Site. ENV America staff received correspondence from Owen Chung of Caltrans, on February 16, 2005. Mr. Chung indicated that the only potential impact upon the Site from the SR-905 project is that Caltrans may seek a drainage easement for a storm drain discharge to a point immediately south of the Barnhart property and west of the waste fill. Caltrans has not finalized their plans, nor has Caltrans requested a specific easement. Based on available information, the Caltrans project could require minor changes in the final detailed drainage design for the Sesi Property Closure Project.

1.4 Plans for Site Development

Currently there are no specific plans for development of the Sesi Property.

1.5 Objectives

The objectives of this RAW are as follows:

- Review of the investigative results regarding the Sesi Property and the adjacent Barnhart and Dantzler properties. These investigative results include the geological, hydrological, hydrogeological, geotechnical, and analytical results of soil and groundwater sampling;
- Use of the investigative results as a basis to develop remediation action objectives;
- Identify and screen available remedial options to develop a list of appropriate and viable alternatives and prepare a detailed cost analysis of these viable alternatives;
- Select the most appropriate and cost effective alternative for implementation; and,
- Prepare the RAW for the selected alternative.

1.6 Report Organization

This report has been organized as follows:

Section 1.0 - Introduction

Section 2.0 - Physical Setting, describes geology, hydrogeology, biology, and waste characteristics.

Section 3.0 - Site Characterization Results, presents the analytical results of the ash and auto-shredder wastes samples.

Section 4.0 - Responsible Agencies and Regulatory Requirements, describes the responsible agencies and the regulatory requirements governing closure and post-closure maintenance.

Section 5.0 - Remedial Action Goals and Objectives, describes remedial action objectives and goals for the Site.

Section 6.0 - Identification, Screening, and Evaluation of Remedial Alternatives, describes the identification and screening process used to evaluate remediation alternatives that were considered for the Site.

Section 7.0 - Evaluation of Remedial Alternatives, presents detailed evaluation of Site-specific alternatives and selects the most appropriate alternative.

Section 8.0 - Engineering Plan for the Final Cover, presents the factors considered in the final cover design for the Site.

Section 9.0 - Stability of Final Slope, summarizes evaluations of seismic hazards, slope stability, and liquefaction analyses.

Section 10.0 - Landfill Settlement, describes the contributing factors to the landfill settlement and estimates the expected potential settlement at the Site.

Section 11.0 - Grading, Drainage Control, and Structures, presents criteria used for design and description of planned improvements.

Section 12.0 - Groundwater Monitoring Plan, describes the proposed groundwater monitoring program for the Site.

Section 13.0 - Post-Closure Land Use and Site Security, describes the Site use after closure and the type of security for the Site.

Section 14.0 - Site Environmental Controls and Existing Structures, describes decommissioning or alteration of existing structures during closure construction.

Section 15.0 - Projected Closure Schedule and Closure Cost Estimate, provides a schedule for closure construction and the estimated costs during the post-closure maintenance period.

Section 16.0 - Post-Closure Maintenance Plan and Estimated Cost, outlines maintenance for cover vegetation, drainage system, and Site security, and provides estimated costs during the post-closure maintenance period.

Section 17.0 - Worker and Community Heath and Safety, outlines a health and safety plan for Site workers and the community during construction activities.

Section 18.0 - Limitations and Professional Certification.

Section 19.0 - References.

Exhibits include: Exhibit A - Geotechnical Laboratory Data; Exhibit B - Technical Specifications for Final Closure; Exhibit C - Quality Assurance and Quality Control Program for Sesi Property Closure Construction; Exhibit D - Hydrology Evaluations; Exhibit E - Post-Closure Site Inspection Checklists; Exhibit F - Soil Erosion Calculation; Exhibit G - Post-Closure Emergency Response Plans; Exhibit H - Worker Health and Safety Plan; and Exhibit I - Community Health and Safety Plan.

2.1 Climate

The climate in the vicinity of the Site is generally warm, with dry summers and mild winters. The mean annual precipitation is about 12 inches (California Department of Water Resources [DWR], 1986). During periods of adequate precipitation, surface water run-on from north and east of the Site flows onto and across the landfilled waste and drains to Spring Canyon.

2.2 Geology

2.2.1 Regional Geologic Setting

The Site area is located in the eastern limits of the San Diego Embayment, on the Otay Mesa. The San Diego Embayment is characterized as sedimentary rocks that were deposited by coastal marine seas since the Cretaceous Period, starting over 65 million years ago. Within the last two to three million years, the region was structurally uplifted above sea level. The emergence was episodic, which allowed for a series of stair-stepped marine terrace surfaces to form. The higher and older terraces formed against the mountains that presently form the core of the northwest-trending Peninsular Ranges. Subsequent stream erosion of the marine sediments has resulted in deep incisions and the formation of mesa surfaces that are separated by prominent westward flowing drainages.

The Site region has not undergone strong structural deformation such as other portions of southern California and northern Baja California. The sedimentary sequence in the Site region rests on a metamorphic basement complex known as the Santiago Peak Volcanics of upper Jurassic age. The overlying sediments have been slightly tilted westward but strong folding and faulting have not been identified in the Site region. Pleistocene age normal faulting and associated synclinal folding have resulted in development of the San Diego Bay Trough along the coast west of the Site. This feature is considered geologically young and seismological evidence suggests structural deformation is continuing near and offshore of the coast.

2.2.2 *Geologic Units*

As part of a regional study, the Site area was mapped by the California Division of Mines and Geology (Kennedy and Tan, 1977). The entire Site is underlain by bedrock strata, principally comprising claystone and sandstone that is assigned to the Tertiary-age Otay Formation. The Otay Formation was named by Cleveland (1960) because it contained bentonitic claystone and was confined to the Otay Mesa area. The bentonitic claystone was derived from the chemical alteration of volcanic ash that had accumulated in a marine sea.

The Otay Formation is unconformably overlain by the Quaternary-age Linda Vista Formation. The Linda Vista Formation consists of near shore, marine and nonmarine sediments that were deposited on a wave-cut platform during Pleistocene time. This formation mantles many of the mesas in the San Diego area. Stream erosion has down-cut through the Linda Vista Formation to expose Otay Formation sedimentary units in the bottom of Spring Canyon.

The southern wall of Spring Canyon, immediately downstream from the landfilled waste, is mantled by a relatively thin veneer of Quaternary slopewash. The slopewash was apparently fully removed from the northern wall, and used as soil cover during landfilling.

Quaternary stream alluvium is confined to the floor of Spring Canyon and is locally concealed beneath the waste fill materials. The alluvium consists of locally derived, fine and coarse-grained sediments.

The distribution of geologic units exposed at the Site is shown on Figure 2-1 - Geologic Site Plan. Idealized stratigraphic profiles are shown on Figures 2-2, 2-3, and 2-4 - Geologic Cross-Section B-B', G-G', and G'-G," respectively. Additional cross-sections and logs of borings and test pits used to interpret the subsurface geology are presented in ENV America's (1996a) Geotechnical Report. A description of each geologic unit mapped at the Site, including waste fill materials, is presented below.

2.2.2.1 *Tertiary Otay Formation (Map Symbol To)*

The Otay Formation is the only bedrock formation found at the Site, and is Oligocene in age (Walsch and Demere, 1991). The Otay Formation is estimated to be more than 1,000 feet thick in the Site area (Department of Water Resources [DWR, 1986]). As encountered during reconnaissance mapping and borehole drilling, this formation predominantly consists of claystone and siltstone, with subordinate units of sandstone. The claystone was observed to be generally light to medium grey in color, very stiff to hard, with a massive texture and waxy luster. The siltstone is predominantly medium grey, hard, micaceous and massive. The sandstone is grey to brown, fine grained, very dense and moderately friable. Where exposed, the bedrock hosts high-angle (i.e., steep), discontinuous, orthogonal joint fracture sets.

2.2.2.2 *Quaternary Linda Vista Formation (Map Symbol Ql)*

The Linda Vista Formation unconformably overlies the Otay Formation and is present along the sides of the waste fill area. Based on mapping and borehole information, the Linda Vista Formation averages an approximate thickness of about 30 feet within the immediate site area. The formation was observed to be a reddish to orange-brown, poorly to moderately indurated, cobble to boulder conglomerate with a clayey to silty sand matrix.

2.2.2.3 *Quaternary Slopewash Deposits (Map Symbol Qsw)*

Quaternary slopewash, natural topsoil that develops on sloping terrain, was mapped on the southern wall of Spring Canyon. Based on analysis by EAV (1991), this unit was surficially scraped for use as cover during landfill operations. Therefore, the original thickness was most likely greater than the 2 to 3 feet that was observed during our field exploration. This unit consists of medium to dark brown, loose to medium dense, silty gravelly sand. The slopewash supports a moderately thick growth of chaparral-type vegetation, creating a relatively organic-rich unit.

2.2.2.4 *Quaternary Alluvium (Map Symbol Qal)*

Quaternary alluvium, a natural water-lain material, was mapped along the bottom of Spring Canyon and was encountered in boreholes drilled beneath waste materials. As encountered at the site, the alluvium can be divided into three principal subunits, a natural coarse-grained deposit, a natural cohesive deposit, and a generally granular deposit admixed with debris from the Site.

The natural coarse-grained subunit generally consisted of dark grey, gravelly sands and sandy gravel. The natural cohesive unit as observed in Test Pits TP-1, TP-2, and TP-3 consisted of a medium to dark grey, plastic, fat clay. The combined thickness of the natural alluvium varies from about 3 to 5 feet. The cohesive subunit was encountered locally, but for the purposes of slope stability analyses, it has been assumed to exist throughout the canyon bottom.

The alluvium admixed with debris is essentially limited to the area downstream from the principal waste fill area. This subunit generally consisted of medium to dark brown silty sand with scattered glass and ceramic shards, wood, concrete and gravel.

2.2.2.5 Artificial Fill Materials

Auto Shredder Waste (Map Symbol Afs) - The auto shredder waste consists of shredded automobile waste, admixed with soil. The auto shredder waste includes metal strapping, rubber stripping, rubber and plastic fragments, tires, fan belts, fabric, aluminum sheeting and glass. The admixed soil generally consists of dark grey to brown silty sand.

Burn Dump Ash (Map Symbol Afa) - The burn dump ash materials (ash) were observed in exposures and boreholes as principally composed of silty sand with scattered glass and ceramic shards. The term ash is considered to be a conceptual misnomer, as it is really a soil containing approximately 10 percent to 20 percent noncombustible waste material (e.g., glass/ceramics). The ash is generally located at the western limits of the waste fill and comprises the eroded slope face. Surface water action has eroded the waste fill surface and fill material from the western slope face and deposited it at the toe and downstream in Spring Canyon. Prominent erosional scars (i.e., rills and small gullies) exist along the western slope face. The ash at the Barnhart and Dantzler properties was classified as nonhazardous by the Department of Toxic Substance Control on February 28, 1996.

Miscellaneous Fill (Map Symbol Af) - The overall waste fill surface is mantled by a veneer of relatively heterogeneous miscellaneous fill soil. In general, the miscellaneous fill was observed to consist of grey to brown silty sand, clayey sand and gravelly sand. Scattered debris is common, including auto shredder waste, wood, asphalt and concrete rubble. The thickness varies from less than 1 foot to as much as 5 feet. A significant artificial fill was mapped by ENV America at the eastern portion of the Site associated with the roadway embankment for Cactus Road where it crosses Spring Canyon.

2.2.3 Geologic Structure

The post-Cretaceous geologic structure in the region is relatively uncomplicated and generally consists of a mild, westerly-dipping homocline (Kennedy and Tan, 1977). Over the last 65 million years, marine seas have regressed and transgressed many times in response to global sea level changes and tectonic uplift. The final withdrawal of the seas in the San Diego Embayment occurred within the last 2 million years and was primarily due to regional uplift. The uplifting process resulted in the southwest tilting of the sedimentary bedrock sequence. Bedding in the Otay Formation bedrock units of the Site area observed during our field exploration, though poorly developed, strikes to the northwest and dips about 5 to 10 degrees to the southwest. Joints were also observed striking northwesterly and to a lesser degree northeasterly, dipping at high angles (>70 degrees).

The northwesterly structural trend in the site area is consistent with the mountain ranges of the Peninsular Ranges. The structural trend is regional, manifested by the San Andreas Fault Zone, which causes the Peninsular Ranges to move toward the northwest. During Pleistocene time, San Diego Bay formed, reflecting a northwest-trending synclinal trough. Faults to either side and within the feature have been recognized, the La Nacion Fault being the closest to the Site. Most of the faults display normal, westerly-dipping movement. The most prominent fault projecting through San Diego Bay is the active Rose Canyon Fault which displays mostly right-lateral movement. The faults associated with the Rose Canyon or La Nacion structures have not been mapped within or to project toward the Site (Kennedy and Tan, 1977).

2.2.4 Faulting

Historically, the San Diego coastal region has experienced fewer severe earthquakes than other portions of southern California. Figure 2-5 - Active Faults and Historical Earthquake Epicenters Within 100 Miles, illustrates the location of the Site with respect to major regional and local faults in southern California and northern Baja California. Major active faults exist and large magnitude earthquakes have occurred to the east of the region on faults associated with the San Andreas fault system. These include the South Branch of the San Andreas, and San Jacinto and Elsinore faults. Collectively, these faults form the boundary of the Pacific and North American tectonic plates. To the west and offshore of San Diego, three active northwest-trending fault zones have been identified and include the San Clemente-San Ysidro, San Diego and Coronado Bank faults (Jennings, 1992).

The relative lack of investigation in northern Baja California (Baja) has limited the knowledge of potential seismic hazards. Two zones in northern Baja are recognized to produce major earthquakes and/or fault rupture. Southern extensions of the Elsinore (Laguna Salada) and San Jacinto (Cerro Prieto) faults within the Imperial Valley of Mexico have produced major historic earthquakes. In 1956, a Magnitude 5.8 (M5.8) earthquake and associated surface rupture occurred on the northwest-trending San Miguel fault which projects nearly to the City of Tijuana, Mexico. Late Quaternary faulting has also been identified along the Agua Blanca fault zone south of Ensenada, Mexico (Rockwell et. al., 1993). Other faults potentially capable of generating strong ground shaking at the Site lie in proximity to the City of Tijuana, and trend both to the northwest and northeast (Jennings, 1992). Little is known about these faults other than they have moved in early Pleistocene time, more than 700,000 years ago.

Projecting through the downtown portion of the City of San Diego and continuing southward through San Diego Bay is the Rose Canyon fault zone. The Rose Canyon fault is located about 6 miles to the west of the Site and is the closest known active fault. Active faults are defined as those that have ruptured the ground surface in the last 10,000 years or have associated seismicity. Faults that ruptured in the last two million years are considered potentially active. They are less capable of future activity and have much longer recurrence intervals between earthquakes of 10,000 years or more.

The north-south trending La Nacion fault is located about 2.5 miles to the north-northwest of the Site and is the closest known potentially active fault. The fault consists of a series of parallel and overlapping segments with steep, normal (down to the west) displacement. The zone is up to 0.5 miles wide and truncates stratigraphy associated with the Linda Vista Formation of early Pleistocene age (Kennedy and Tan, 1977). There are no known or mapped active faults that trend directly through the site and the potential for direct surface fault rupture is considered remote. The Site does not lie within an Alquist-Priolo Earthquake Fault Zone, which are zones around faults that have been established by the State of California as requiring special fault studies prior to siting any structures within them.

2.2.5 Seismicity

An earthquake search was performed for events within a radius of 100 miles from the Site from 1880 to 1994 and with magnitudes ranging between 4.5 and 8.0 using the computer program EQSEARCH developed by Blake (1994). The distribution of the earthquake epicenters is shown on Figure 2-5, and the events are listed in Exhibit F - Historic Earthquake Events, of ENV America's Geotechnical Report (1996a). Earthquakes recorded and shown on Figure 2-5 are located within both the United States and northern Baja California, Mexico. The search turned up 385 historic events with the closest event located 20 miles to the northeast of the Site.

Moderate to major historic earthquakes have not occurred locally in the greater San Diego area. The largest regional earthquakes have occurred offshore, in Baja California, or within the Imperial Valley. The most significant local earthquake that has been recorded was a Magnitude (M) 4.6 event that occurred on June 29, 1983. The epicenter was located offshore 23 miles northwest of the Site. On July 13, 1986, an M5.3 earthquake occurred approximately 30 miles south of Oceanside within the San Diego Trough fault zone. Significant nearby events in the search area include an M6.3 earthquake located about 40 miles east of the Site, close to Elsinore Fault Zone, which occurred on February 24, 1892. A large number of M5.9 to M6.8 events occurred on fault strands associated with the San Jacinto Fault. This fault system is located on the western side of the Imperial Valley about 70 miles to the east of the Site.

2.3 Hydrogeology

2.3.1 Regional Hydrogeologic Setting

Hydrologically, the Site is situated in the San Ysidro Hydrologic Subarea, within the Tijuana Hydrologic Area of the Tijuana Hydrologic Unit (Regional Water Quality Control Board {RWQCB}, 1994). Beneficial uses of groundwater within the San Ysidro Hydrologic Subunit include municipal, agricultural and industrial (RWQCB, 1994). The principal groundwater body in the region occurs in deep sand and silt units within the Otay Formation (DWR, 1986). Based on available water well data, the depth to the principal groundwater body is on the order of about 425 feet below ground surface (bgs) (DWR, 1986).

2.3.2 Hydrogeologic Units

Three distinct, shallow water bearing units have been identified at the Site: the alluvial material within the Spring Canyon drainage; the landfilled waste; and, a thin water bearing unit in the Otay Formation.

2.3.2.1 Alluvial Material Hydrogeology

Unconfined groundwater exists in the alluvium, both beneath the waste and downstream of the Site. As measured in groundwater Monitoring Well WS-5 (Figure 2-1), shallow groundwater occurs at about 2 to 3 feet bgs. Very little quantitative information is available to describe the hydrogeologic characteristics of the alluvium. Based on the local geology and hydrology, it is likely that the majority of the flow in the alluvium from the base of the landfilled waste is from recharge from both topographically upgradient runoff and from downward migration and percolation of water through the waste. Once the source of recharge is removed, the flow in the alluvium at the toe of the landfilled waste should diminish noticeably.

2.3.2.2 Landfilled Waste Hydrogeology

There is shallow unconfined groundwater in both the auto shredder waste and the burn dump ash deposits. Groundwater in the landfilled waste flows southwesterly, parallel to the buried channel of Spring Canyon. Water level information collected from wells completed in the auto shredder waste and the ash indicates that there is a minimal hydraulic gradient between the ash and the shredder deposits that is probably related to the porosity differential between the two materials. The average hydraulic gradient in the landfilled waste material is approximately 0.017 ft/ft, steepening appreciably at the downstream face. Field observations indicate that during periods when the water levels in the waste are higher, there is seepage from the downstream face, primarily located in the vicinity of the 450 feet elevation. The waste deposits respond rapidly and significantly due to recharge from precipitation events indicating that the majority of recharge to the landfilled material is probably from infiltration of run-on. Figure 2-6 - Groundwater Elevations, Waste Materials, is a piezometric surface map of the Site generated from data collected at the maximum water levels measured during the period from October 1994, to March 1996. The contours at the downstream face of the landfilled materials were added to the figure based on field observations of seepage from several areas along the scarp.

2.3.2.3 Upper Otay Formation Hydrogeology

The lower water bearing unit is found at approximately 60 to 80 feet below ground surface. Information regarding this zone has been developed based on data collected from four monitoring wells (WS-4, MW-2, MW-4 and MW-6) (Figure 2-1). The unit is a sandy to clayey siltstone member of the upper Otay Formation. The unit appears to be separated from the landfilled waste and alluvial deposits by 3 to 12 feet of claystone and silty claystone. Along the northern portions of the Site, this zone is unconfined. Toward the southern portion of the Site, the unit becomes confined. The average hydraulic gradient in this unit is 0.048 ft/ft in a general southwest direction. Figure 2-7 - Groundwater Elevations, Upper Otay Formation, shows the potentiometric surface of the upper Otay water bearing zone based on the highest water level information obtained during the period from October 1994 to March 1996. Water level information collected from wells completed in this zone indicate that the unit is sensitive to changes in recharge associated with precipitation events. However, based on water quality information, the major recharge source is surface run-on and infiltration of that water from sources located off of the Site and is not from downward infiltration from the waste area. The structure of the Otay Formation is such that this upper unit is not in contact with the principal water bearing aquifer that is approximately 425 feet below ground surface.

2.3.3 Regional Water Use

A listing of water wells located in the general vicinity of the Site was compiled (Table 2-1 - Water Supply Wells in the Vicinity of the Site) from the Department of Water Resources data. Figure 2-8 - Water Well Location Map, shows the approximate locations of the listed wells. Based on the collected information and field observations the majority of the listed wells are deep - irrigation wells, pumping from water bearing strata at depths greater than 500 feet below the property.

In 1994 and 1985, the California Department of Water Resources (DWR, 1986) sampled and analyzed seven, out of ten water supply wells, located in the Site vicinity. The DWR data showed that total dissolved solids (TDS) concentrations as high as 7,380 milligrams per liter (mg/l) have been detected in these water supply wells. Considering that the drinking water standard for TDS is between 500 and 2000 mg/l, the regional natural groundwater in the area appears to be of poor quality and not suitable for drinking.

2.3.4 Groundwater Quality

Groundwater quality information was collected at the Site on at least six separate occasions (November 1990 [Geocon], July 1991 [Applied Geosciences, two sampling events], August 1991 [Applied Geosciences], December 1994 and July 1995 [ENV America]). The data presented herein are primarily based on two sampling events conducted by ENV America in 1994 and 1995 (ENV America 1996b), in which the constituent list included Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), major anions and cations, and selected metals. The analytical results for the 1994 and 1995 sampling events are summarized in Table 2-2 - Summary of Groundwater Analyses.

2.3.4.1 Volatile Organic Compounds (VOCs)

Based on historic information, traces of aromatic hydrocarbon compounds (benzene, toluene, xylenes, ethylbenzene [BTEX], and carbon disulfide) were previously detected in the groundwater samples, collected from the wells completed in the auto shredder waste and the burn dump ash at the Site. Traces of toluene and xylenes had also been found in the bedrock monitoring well. BTEX were detected in wells (Table 2-2) completed within the burn dump ash and the auto shredder waste. Only toluene and ethylbenzene have been detected in the upper water-bearing unit of the Otay Formation.

In addition to the aromatic hydrocarbon compounds, minor concentrations of tetrachloroethene (PCE), a halogenated hydrocarbon, were detected in wells completed in the burn dump ash during previous sampling events. However, PCE was not detected in samples collected during the most recent sampling event in July 1995.

2.3.4.2 Semi-Volatile Organic Compounds (SVOCs)

SVOCs were detected during various sampling events onsite. Historically, Bis(2-ethylhexyl)phthalate and 2,4-Dimethylphenol were detected. Both compounds were also detected during recent sampling events (Table 2-2). The Bis(2-ethylhexyl)phthalate is a plasticizer that is a common sampling contaminant due to leaching of the PVC casing, use of plastic hose in sampling, use of PVC bailers, or laboratory technicians using plastics in the analysis process. Therefore, since it was found in only one well completed in the auto shredder waste during one sampling event, it is not regarded as significant.

The second SVOC found in the recent sampling, 2,4-Dimethylphenol, is a major constituent of a common degreaser with the commercial name Xylenol used in auto mechanic shops. The relatively high concentrations found during high water conditions onsite are related to the mobility of total xylenes, which is the other major constituent of this particular degreaser. Once the selected remedial alternative (see Section 8.0) is installed and operational and the source of recharge is removed, concentrations of 2,4-Dimetholphenol in the groundwater should decrease.

2.3.4.3 Metals

Historically, groundwater samples collected from the Site have contained notable concentrations of lead and zinc as well as detectable concentrations of arsenic, copper and cadmium. During the 1994 and 1995 sampling events, lead was detected in the wells completed within the auto shredder waste and the burn dump ash. Lead concentrations in groundwater within the auto shredder waste (Wells WS-1 and MW-7) were consistently greater than in groundwater within the burn dump ash. Review of groundwater quality information indicates that in addition to lead, barium, nickel, and total chromium were detected in one sample during the 1994 and 1995 sampling events.

Arsenic is the most notable metal detected in the groundwater wells completed in the upper bedrock unit of the Otay Formation. Since the primary recharge area for this unit is located upgradient of the Site in a predominantly agricultural area, it is likely that the detected arsenic levels in the bedrock are the result of groundwater migration onto the Site carrying arsenic from agricultural operations or from naturally occurring conditions in the formation.

2.3.4.4 Major Anions and Cations

During the 1994 and 1995 sampling events, the concentrations of the major anions and cations within the groundwater were evaluated. The results of that evaluation are included in Table 2-2. Generally speaking, water quality within the waste material is poor, with high concentrations of chlorides, sodium and bicarbonate. The TDS concentration in all tested water exceeded the recommended drinking water standards.

As mentioned in Section 2.3.3, historic background water quality information, obtained from the regional water wells indicate that TDS and chloride concentrations are generally above the drinking water standards. The DWR data showed that TDS concentrations as high as 7,380 mg/l have been detected in these water supply wells in the vicinity of the Site. Considering that the drinking water standard for TDS is between 500 and 2000 mg/l, the regional groundwater in the area appears to be of poor quality and not suitable for drinking.

2.4 Biology

The site is located in the Otay Mesa area and partially within the Multiple Habitat Planning Area (MHPA) of the City of San Diego Multiple Species Conservation Program (MSCP). The Site has undisturbed areas, areas disturbed by the landfill, and other subsequent activities. Biological surveys and reports were produced to analyze project impacts and appropriate mitigation per United States Environmental Protection Agency (USEPA), California Environmental Quality Act (CEQA), MSCP, United States Forest Service (USFS), California Department of Fish and Game (CDFG), and United States Army Corps of Engineers (USACOE) standards (Chambers, 2005).

Field surveys were completed by Chambers Group, Inc. (Chambers, 2005) to determine the habitats present and the potential presence of listed and sensitive species on the project site, including focused surveys for the listed/sensitive plant and animal species. General biological resource surveys were performed on July 23, 1997, March 21 and September 9, 2002 and November 18, 2003, and included mapping of vegetative communities and surveying for the presence of sensitive species. A delineation of jurisdictional waters was conducted on April 8 and September 9, 2002. Focused surveys for the Quino checkerspot butterfly (*Euphydryas editha quino*) (March and April 2002) and San Diego fairy shrimp (*Brachinecta sandiegoensis*), and Riverside fairy shrimp (*Streptocephalus woottoni*) (September 2003) did not detect the presence of these species.

Focused pre-construction surveys for the Quino checkerspot butterfly, least Bell's vireo (*Vireo bellii pusillus*) and coastal California gnatcatcher (*Polioptila californica californica*) will be performed in the appropriate season during the year of construction.

Seven vegetation communities were identified on the project site and mapped. Three communities were determined to be non-native (tamarisk scrub, non-native grassland, ruderal), and four were native (maritime succulent scrub, Diegan coastal sage scrub, *Atriplex canscens*-dominated scrub, and southern willow scrub). Wetland delineation surveys determined that both the CDFG and USACOE have jurisdiction over areas within the Sesi property and the landfill. However, only CDFG jurisdictional wetlands are located within the planned construction area for closure of the landfill.

3.0 SITE CHARACTERIZATION RESULTS

This section presents the analytical results of the ash and auto-shredder wastes samples, collected at the Sesi Property and the adjacent Barnhart and Dantzler properties. Reportedly, the ash was initially excavated from the former Rancho Carillo-City of Coronado Municipal Landfill and placed at the Site and the adjacent Barnhart and Dantzler properties in 1987. The Barnhart and Dantzler properties also contain auto-shredder wastes similar to those encountered at the Site. Therefore, the following sections present the analytical results of the ash and auto-shredder wastes samples, collected at the Sesi, Barnhart, and Dantzler properties by several consultants, including ENVIRON (1998), Geocon (1991), and Applied Geosciences (1991).

3.1 Results of Ash Samples

ENVIRON (1998) summarized the results of extensive ash sampling conducted at Barnhart and Dantzler properties. The sampling results showed that the ash is generally dark brown to reddish brown silty sand and contain an abundance of glassy shards and occasional porcelain and brick fragments. The ash is readily visually differentiated from the auto-shredder wastes, which consists of muffler parts, rubber belts, fabric remnants, and the like.

ENVIRON conducted several sampling activities at the Barnhart and Dantzler properties. The results of the ash samples are summarized as follows.

3.1.1 ENVIRON Results of 1993/1994 Ash Samples

In 1993 and 1994, ENVIRON conducted several drilling, trenching, soil sampling, and laboratory analyses programs. These activities included drilling 14 borings at the Barnhart property, and 4 borings at the Dantzler property. In addition, ENVIRON excavated 24 trenches at the Barnhart property and 10 trenches at the Dantzler property. The analytical results for soluble copper and lead concentrations as measured by the Waste Extraction Test (WET) procedure in the ash samples are reported in ENVIRON (1998) (see ENVIRON's Tables 1 and 2).

Out of 37 boring samples and 36 trench samples analyzed for soluble copper, 7 samples contained soluble copper concentrations exceeding Soluble Threshold Limit Concentration (STLC) for copper (25 mg/l). The highest soluble copper concentration detected was 30 mg/l. In addition, soluble lead concentrations of 9 samples exceeded the STLC for lead of 5 mg/l. The highest soluble lead concentration detected was 80 mg/l. The total lead concentrations were below the Total Threshold Limit Concentration (TTLC) of 1,000 milligrams per kilogram (mg/kg) for lead.

3.1.2 Results of ENVIRON's 1994 Testing for Nonhazardous Classification of Ash

In July 1994, ENVIRON submitted a work plan to the Department of Toxic Substances Control (DTSC) for additional testing and research for nonhazardous classification of ash. In August 1994, ENVIRON collected 16 soil samples from 4 trenches at the Barnhart property. These samples were analyzed for total copper, lead, and the remaining Title 22, California Code of Regulations (CCR) metals, soluble copper and lead, volatile organic compounds (VOCs by USEPA Method 8240), and semi-volatile organic compounds (SVOCs by USEPA Method 8270). The results of these analyses were presented by ENVIRON (1998) (see ENVIRON's Tables 2 and 3). Of the 12 samples analyzed, soluble copper concentrations in 3 samples exceeded the STLC for copper of 25 mg/l, with the highest soluble copper concentration of 29 mg/l. Soluble lead concentrations did not exceed the STLC for lead of 5 mg/l. The highest soluble lead concentration was 3.9 mg/l.

Of the 4 ash samples analyzed for total Title 22, CCR metals (except copper and lead) only one ash sample contained a total concentration exceeding 10 times the STLC (nickel). Of 2 samples analyzed, the VOCs and SVOCs were not detected above the detection limits.

ENVIRON performed four tasks to support the nonhazardous classification of the ash. These tasks included a copper speciation study, fish bioassay study, database search and literature review, and hazard/risk assessment for "uncontrolled" use and disposal scenarios.

Based on the results of these studies (see ENVIRON 1994, 1995 and 1998), ENVIRON concluded that:

- The ash exhibits low copper solubility and bioavailability;
- The ash has low aquatic toxicity;
- Copper in ash has low human and animal toxicity; and,
- The ash poses no significant hazard or risk to humans, livestock and wildlife.

The report on nonhazardous classification of ash (ENVIRON, 1994) was reviewed by the DTSC. However, the DTSC was unable to render a decision at the time and requested additional information (DTSC letter, dated February 27, 1995).

3.1.3 Results of ENVIRON's 1995 Investigation for Ash

In April 1997, ENVIRON collected 10 ash samples from two trenches excavated at the Barnhart property, and collected 5 samples from four trenches at the Dantzler property. The Barnhart samples were analyzed for soluble copper and lead using the WET procedure. The Dantzler samples were analyzed for total copper and lead, as well as soluble copper and lead. The results of these samples are summarized in Table 2, ENVIRON (1998).

One of the ten Barnhart samples exceeded the STLC for copper (with a concentration of 29 mg/l), and all the ten samples exceeded the STLC for lead (the highest concentration was 16 mg/l). The five Dantzler samples contained total copper concentrations, ranging between 33 mg/kg and 1,000 mg/kg. Furthermore, the five samples contained total lead concentrations ranging from 41 mg/kg to 560 mg/kg.

ENVIRON performed a lead speciation study as part of its effort to prepare responses to DTSC's comments. In addition, ENVIRON conducted a literature search of the physical, chemical and toxicological properties of lead oxide and lead hydroxide, the predominant lead species in the ash. Based on these studies, ENVIRON (1998) concluded that lead in ash should be considered insoluble and immobile, under prevailing environmental conditions.

3.1.4 ENVIRON's TCLP Results for Ash

ENVIRON performed three soluble copper and lead analyses, using the USEPA's Toxicity Characteristics Leaching Procedure (TCLP). The TCLP results are presented in ENVIRON (1998) (see ENVIRON Table 2). The TCLP results showed that the ash is not considered a Resource Conservation and Recovery Act (RCRA)-hazardous waste.

3.1.5 ENVIRON's Nonhazardous Classification of Ash

ENVIRON submitted the results of ash classification to the DTSC in two reports (ENVIRON 1994 and 1995). Based on the review of these two reports, the DTSC granted a nonhazardous classification to the ash at the Barnhart and Dantzler properties (DTSC, letter dated February 28, 1996). Due to the fact that the source of the ash in Barnhart and Dantzler properties is the same as the Site, the nonhazardous classification of ash should apply equally to the Sesi Site.

3.2 Results of Auto-Shredder Waste Sample Analyses

The analytical results of the auto-shredder samples obtained by Geocon (1991) and Applied Geosciences (1991) at the Site, as well as by ENVIRON (1995) at the Dantzler property, are presented in this section. The results of these investigations showed that the auto-shredder wastes are characterized as dark gray to light bluish gray, clayey fine sand and silt intermixed with wood, synthetic foam, rubber, and metal debris.

3.2.1 Geocon (1991) Results for Auto-Shredder Waste

In October 1990, Geocon collected samples from six trenches and three borings at the Sesi Site (Geocon, 1991). Three samples were auto-shredder wastes. The samples were analyzed for Title 22, CCR metals and organic priority pollutants. Total copper was detected at concentrations of 226, 129, and 18.6 mg/kg. Total lead concentrations were reported as 286, 124, and 919 mg/kg. Concentrations of the other CCR metals were relatively low. The organic analyses of the samples indicated presence of chlordane, DDE, and polychlorinated biphenyls (PCBs), with the maximum concentrations detected at 0.16, 0.066, and 0.40 mg/kg, respectively.

3.2.2 Applied Geosciences (1991) Results for Auto-Shredder Wastes

In July and August 1991, Applied Geosciences collected samples from six trenches and 10 borings at the Site (Applied Geosciences, 1991). Six samples were from the auto-shredder wastes. The samples were analyzed for soluble copper and lead using the WET procedure. The summary of the analytical results showed the following ranges: total copper concentrations of 232 to 2,340 mg/kg; total lead concentrations of 1,810 to 5,600 mg/kg; soluble copper concentrations of <0.02 to 20.5 mg/l; soluble lead concentrations of 56.9 to 1,020 mg/l.

3.2.3 ENVIRON (1995) Results for Auto-Shredder Wastes

In 1995, ENVIRON collected three auto-shredder waste samples from the Dantzler property and analyzed for total copper and lead (ENVIRON, 1995). The results of these samples are summarized as follows: total copper concentrations of 760, 840, and 990 mg/kg; total lead concentrations of 1,800, 4,200, and 3,100 mg/kg.

According to ENVIRON, auto-shredder waste is considered a special waste and by regulation can be deposited in a Class III landfill.

3.3 ENVIRON'S Qualitative Risk Assessment and Conceptual Site Model

ENVIRON performed a hazard/risk assessment for the Barnhart and Dantzler properties. Due to similarities in hydrogeologic setting and site history between these properties and the Sesi Site, the results of ENVIRON's Qualitative Risk Assessment and Conceptual Model applies equally to the Sesi Site. ENVIRON determined copper and lead as the chemicals of concern (COCs) in the ash and auto-shredder wastes. These COCs can theoretically disperse into four media: surface soil, air, surface water, and groundwater. The COCs can potentially reach human or ecological receptors through complete exposure pathways. A complete exposure pathway requires an exposure medium (such as groundwater), an exposure point (such as a groundwater well), and exposure route (such as ingestion of water). The following are the discussions of the exposure points and exposure routes for the four above-mentioned media.

Groundwater. As discussed in Section 2.3.2.2, the groundwater flow direction at the Sesi Site is toward the southwest. ENV America's calculations (ENV America, 1996b) showed that the majority of the groundwater in the landfill is generated by infiltration of natural precipitation. Installation of the cap (see Section 8.0) will greatly reduce the source of groundwater recharge at the Site. In addition, a subdrainage system is planned for the landfill in conjunction with the cap and the slope stabilization berm at the toe of the final slope. Any potential leachate will be intercepted and collected and treated (if required) through the subdrainage prior to discharge to the environment See Section 16.8). Therefore, there will be no exposure points for the groundwater at the Site which renders the groundwater as an incomplete pathway for offsite receptors.

Surface Soil. Direct contact of the ash or auto-shredder wastes by potential receptors is the main release or transport mode for this media. The potential receptors include people living onsite, onsite workers, trespassers, and wildlife. Exposure routes are ingestion, dermal contact, and physical hazards. Affected wildlife can also act as a secondary receptor, if they are consumed by humans or other wildlife. The selected remedial alternative (see Section 8.0) includes capping the Site, which eliminates the above-mentioned exposure route. However, the only potential primary receptor will remain the people who may dig through the cap and may come into contact with ash and auto-shredder wastes. As part of the post-closure maintenance plans (see Section 16.0) the Site will be secured with a fence and maintained as vegetated area. This will greatly reduce the possibility of digging through the cap and contacting the waste.

Air. Exposed ash and auto-shredder wastes may be released into the air by wind. Primary receptors, which include people living offsite and onsite, onsite and offsite workers, and trespassers, may potentially be affected through inhalation of dust. However, capping of the site (see Section 8.0) will eliminate this exposure pathway. Airborne particulate dispersion may occur during the construction of the cap. However, the dust control measures that will be taken during the construction will mitigate this potential migration route (see Section 17.0).

Surface Water. The ash and the auto-shredder wastes potentially can be transported offsite by erosion and surface water runoff to streams, lakes, and ponds located downgradient of the Site. The primary receptors potentially could include the people and wildlife who come in contact with the affected water and sediments. Exposure routes potentially could include ingestion, dermal contact and bioaccumulation.

The potential of surface water impact and sediment transport will be controlled through the planned cap installation (see Sections 8.0 and 11.0). The cap will be designed in such a way that the surface water will be diverted and it will not come into contact with the wastes.

Based on a generic conceptual site model (EPA manual entitled "Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfills"), ENVIRON prepared a conceptual site model for the Barnhart and Dantzler properties (ENVIRON, 1988). Due to the similarities between the Barnhart and Dantzler properties and the Sesi Property, ENVIRON's site model applies equally to the Sesi Property. The site model is shown on Figure 3-1 - Conceptual Site Model.

4.0 RESPONSIBLE AGENCIES AND REGULATORY REQUIREMENTS

This section presents the regulatory agencies and regulatory requirements under which this RAW was prepared. A number of state and local regulatory agencies are involved with the closure of the Site and the enforcement of various laws and regulations governing solid waste disposal. The regulatory agencies associated with the closure and post-closure maintenance of the Sesi Site and their responsibilities and requirements are discussed below.

4.1 Regulatory Agencies

4.1.1 County of San Diego Department of Environmental Health (DEH)

Under Chapter 6.65, Division of the Health and Safety Code, the County of San Diego Department of Environmental Health (DEH), Solid Waste Local Enforcement Agency is the administering agency for the investigation and remediation of the Sesi Property. The DEH is responsible for conducting field inspections of solid waste disposal sites, reviewing operating permits, and coordinating with the other involved agencies, as discussed later in this Section. The DEH is also responsible for reviewing closure and post-closure maintenance plans, inspection of closure construction of the Site, and post-closure compliance monitoring. This RAW is submitted to the DEH for review and approval. The DEH will also be the lead agency under the CEQA. A Draft Initial Study and Draft Negative Declaration have been prepared and are being reviewed concurrently with the review of this RAW (Chambers, 2005). Upon receiving and addressing comments on these CEQA documents, the DEH will issue a Final Negative Declaration and Notice of Determination, fulfilling the requirements of CEQA review.

4.1.2 City of San Diego, Development Services Department

The Development Services Department is responsible for development project review for the City of San Diego. The major functions include construction plan check, development and environmental planning, and issuing permits for construction. The closure project is subject to planning, environmental and building codes, guidelines and policies established by the City. As part of the closure design efforts for this project, biology, wetland, and archeological survey reports were submitted to the City for review (Chambers, 2005).

4.1.3 City of San Diego, Solid Waste Local Enforcement Agency (LEA)

The City of San Diego Solid Waste Local Enforcement Agency (LEA) is delegated by the California Integrated Waste Management Board (CIWMB) for permitting, inspection and enforcement of solid waste regulations within the limits of the city. Reviewing closure and post-closure maintenance plans is also one of the responsibilities of the City of San Diego LEA. Following the implementation of this RAW, the City of San Diego Solid Waste LEA will assume post-closure inspection responsibility for the Site under the authority of the California Public Resources Code, Division 30, Part 4, Chapter 2, Article 1, Section 43209.

4.1.4 California Integrated Waste Management Board (CIWMB)

In 1972, the State legislature established the CIWMB under the California Solid Waste Management Act and RCRA to function as the planning authority for solid waste management. This agency has developed regulations governing the operation and permitting of solid waste landfills.

The CIWMB administers the requirements of Title 27 of the CCR and Subtitle D of RCRA. These regulations apply to solid waste facility planning, preparation and enforcement, with authority and responsibilities for both active and inactive landfills. In addition to LEA and the California Regional Water Quality Control Board (RWQCB), San Diego Region, the CIWMB will also review the RAW.

4.1.5 California Regional Water Quality Control Board (RWQCB), San Diego Region

The RWQCB, San Diego Region, administers the applicable requirements of Title 27 of the CCR, which have been established by the State Water Resources Control Board. These regulations apply to both active and inactive landfills, and review of closure and post-closure maintenance plans is a responsibility of the RWQCB. The RWQCB may also need to issue Waste Discharge Requirements (WDRs) for the site. A Stormwater Pollution Prevention Plan (SWPPP), listing relevant BMPs and showing locations of control systems has been prepared (Rick Engineering, 2004). Prior to issuance of the grading permit, the SWPPP will be finalized to address final site designs for and submitted for approval and approved by the City of San Diego to fulfill the requirements for grading activities under the City's Stormwater Permit.

4.1.6 California Department of Fish and Game (DFG)

California Department of Fish and Game is primarily responsible for implementation of the Fish and Game code of California. Specifically, the DFG reviews the closure and post-closure plans for the potential impacts to fish, plants, terrestrial animals, invertebrates, and birds. In addition, the DFG monitors the requirements regarding the potential impacts of the closure activities on water diversion, or changing the natural flow of water at the site. The DFG also monitors the loss, maintenance, and restoration of sensitive habitats at and in the vicinity of the site. This project will obtain a Section 1600/Streambed Alteration Agreement from the California Department of Fish and Game prior to initiating any activities in the vicinity of the onsite drainages and riparian areas.

4.1.7 U.S. Fish and Wildlife Service (USFWS)

The U.S. Fish and Wildlife Service (USFWS) is primarily responsible for stewardship of fish and wildlife in the United States. The USFWS's responsibilities at the federal level are similar to DFG's responsibilities at the state level. For the Sesi Site, the DFG has taken the leading role for implementation of the Fish and Game and Fish and Wildlife codes.

4.1.8 United States Army Corps of Engineer (USACOE)

Section 404 of the federal Clean Water Act (CWA) applies to waters of the United States, including include waterways, streams, and intermittent streams which could be used for interstate commence and their tributaries. In non-tidal waters, the limits of jurisdiction are "ordinary high water marks" such as stream banks. Where wetlands occur above high water marks, they are considered "adjacent wetlands" and are included within USACOE jurisdiction. The term "interstate commerce" has been broadly interpreted to include use by migratory waterfowl or out-of-state tourists, and USACOE's jurisdiction has been extended to wetlands not adjacent to the water of the United States (isolated wetlands). The Sesi Property contains areas under ACE jurisdiction; and some of the remediation activities proposed under this workplan will impact or affect areas under the jurisdiction of the USACOE. Prior to construction a CWA 404 Nationwide Permit will be obtained for work within USACOE jurisdiction.

4.1.9 San Diego County Air Pollution Control District (SDCAPCD)

The San Diego County Air Pollution Control District (SDCAPCD) establishes rules for the control and reduction of pollution resulting from equipment that burns gases, including landfill gases. These rules may require a monitoring and control program for landfill gases, if the emissions are found to be significant. The rules apply to both active and inactive landfills. If the landfill gases are not collected, burned or used to operate any equipment, then the rules of SDCAPCD are not applicable to those landfills.

4.2 Regulatory Requirements

4.2.1 Primary Requirements

Since the range of estimated costs of implementing the effective remedial actions at the site fall below $1,000,000 (see Section 7.0), ENV America proposes to proceed with the remediation of the Sesi Property under Health and Safety Code (HSC) Chapter 6.8, §25356.1 (h) (1) and by submitting and implementing this RAW. Under this section of the statues, when a non-emergency action is proposed and the estimated cost of the proposed action is under $1,000,000, a Remedial Action Plan (RAP) is not required and the DEH can instead approve the implementation of a RAW. The Sesi Property meets the qualifying criteria.

The RAW is developed to carry out a removal action which provides for the protection of human health and safety, and the environment. Removal actions include cleanup and/or other measures to prevent, minimize, or mitigate the effects of the hazardous substance release (HSC §25325). The remedial alternatives, including the complete/partial removal, and engineered cover, described in Section 6.0, meet the definition of a removal action.

In order to comply with the requirements of HSC §25356.1(h)(1), the RAW includes the following:

A. An adequate characterization of the hazardous substance at the site, including public health and safety risks (see Sections 2, 3, and Health and Safety Plan [Exhibit H]).

B. A detailed engineering plan for conducting the removal action, including a description of the techniques and methods to be employed in preventing, minimizing, and/or mitigating the actual or potential threats to human and safety and the environment (see Exhibits B, C, and H).

C. A description of the methods that will be employed to ensure the health and safety of the workers and the public during the removal action (see Health and Safety Plan, Exhibit H).

D. A discussion of the alternatives remedial measures which were considered and rejected, and the basis for that rejection (see Sections 6.0 and 7.0).

Unlike the remaining portions of HSC §25356.1, the requirements under HSC §25356.1 (h) do not include the conformation of the remedial action to the National Contingency Plan (NCP) (40 Code of Federal Regulations Part 300, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]). Thus, an Engineering Evaluation/Cost Analysis (EE/CA) or Remedial Investigation/Feasibility Study (RI/FS) are not needed in the administrative record.

4.2.2 Other Federal and State Laws

In addition to the HSC §25356.1 (h)(1) requirements discussed above, various sections of CCR Title 27 and Subtitle D of RCRA may also be applicable, relevant, or appropriate to the proposed activities on the site for closure and post-closure maintenance. These requirements were used as the basis for regulatory requirements for final cover (see Section 7.0).

This project is also subject to review under CEQA, and qualifies for a Negative Declaration, as mitigation measures proposed with the project ensure that environmental impacts, including those to biological resources, surface and groundwater hydrology, noise and air quality are below a level of significance. A Draft Negative Declaration and Initial Study (Chambers, 2005) are being circulated concurrently with the review of this RAW; public comments received on these documents will be reviewed by the lead agency, DEH, and addressed according to CEQA guidelines prior to issuance of the final CEQA documents.

5.0 REMEDIAL ACTION GOALS AND OBJECTIVES

This section describes remedial action objectives and goals for the Sesi Property. Remedial action objectives (RAOs) are general descriptions of what the remedial actions are intended to accomplish. Remedial action goals, a subset of remedial action objectives, consist of a level of risk or chemical concentrations that are protective of public health or the environment.

5.1 Chemicals of Concern

The chemicals of concern (COCs) identified in the ash and the auto-shredder waste are copper and lead. The WET-soluble concentrations of the ash exceed the STLCs for copper and lead, but the total copper and lead concentrations in the ash are below the TTLCs for these metals. The WET-soluble concentrations of the auto-shredder waste exceed the STLCs for copper and lead, and the total copper and lead concentrations in the auto-shredder waste exceed the TTLCs for these metals. The ash has been classified as a nonhazardous waste (DTSC, 1996), and the auto-shredder waste is a special waste and can be disposed of at a Class III landfill (Sections 66261.120 and 66261.126 of Title 22, CCR). The potential exposure pathways for these COCs are airborne particulates, surface soil, surface water, and groundwater (see Section 3.3).

Considering the appearance of the ash, its chemical analysis results, and its origins, ENVIRON (ENVIRON, 1998), believed that the ash encountered at the Barnhart and Dantzler properties, located adjacent and to the northeast of the Sesi Property, is from a single wastestream. Furthermore, ENVIRON believed that both the ash and the auto-shredder wastes at the Bernhart/Dantzler site are from the same wastestreams as those of the ash and the auto-shredder waste at the Sesi Property, respectively. A single waste stream for the auto-shredder wastes and ash was also interpreted by Environmental Analysis & Evaluation, Inc. (EAV, 1991).

Relatively elevated concentrations of benzene, PCE, arsenic, and lead have been detected in a groundwater monitoring episode performed by ENV America at the Sesi Property, near the southern boundary of the Site.

5.2 Development of Remedial Action Objectives

Section 121 of the CERCLA states that selected remedies should be protective of human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs). The principal remedial action objectives for the Sesi Property are:

- Reduce potential human and environmental health risks associated with COCs within the ash and the auto-shredder waste at the Site.
- Comply with ARARs related to the ash and the auto-shredder waste.
- Maintain groundwater quality consistent with its designated beneficial uses.

5.2.1 Reduction of Human Health Risks and Risks to the Environment

As discussed in Section 5.4, the Site under current conditions, presents a potential health risk to current offsite residents and workers. Migration of ash and auto-shredder waste particulates can occur via the migration of COCs to shallow groundwater and to the creek at the bottom of Spring Canyon.

5.2.2 Compliance with ARARs

The ARARs for remedial actions at the Sesi Property are discussed in Section 5.3. All remedial actions for the Sesi Property will need to comply with the ARARs.

5.2.3 Maintain Groundwater Quality Consistent with its Designated Beneficial Uses

Beneficial uses of groundwater under the Site are municipal, agricultural, and industrial (see Section 2.3.3). As discussed previously (Section 2.3.4), the highest concentrations of chemicals detected in the groundwater at the Sesi Property during the last (July 1995) round of sampling event were: benzene (at 13 µg/l or ppb), arsenic (at 0.67 mg/l or ppm), and lead (at 0.55 mg/l). TDS results obtained by ENV America in July 1995 for the wells constructed in the Sesi Property ranged between 1,100 and 4,200 mg/l. Available groundwater quality results for water supply wells in the vicinity of the Site detected TDS concentrations as high as 7,380 mg/l. Because state action levels for drinking water standards for TDS is between 500 and 1,000 mg/l, it is concluded that both the shallow and the regional groundwater under the Sesi Property are of poor quality and not suitable for drinking, agricultural and industrial use. Also according to the state, water with a TDS >3,000 mg/l is considered as non-drinking water.

Maintaining groundwater quality consistent with its designated beneficial uses is an RAO for the Sesi Property. This objective can be accomplished by substantially reducing the potential for chemical migration by either capping the waste in place or by removing the ash and the auto-shredder waste from the Sesi Property. In addition, an active groundwater liquid management system (see Section 16.8) could prevent the potential offsite migration of impacted groundwater.

5.2.4 Consideration of Current Land Use

The Sesi Property is currently vacant land. There are no specific plans for the use of the Site.

5.3 Description of ARARs

5.3.1 General

ARARs are legally enforceable standards, criteria, or limits promulgated under federal or state law. The terms "applicable" and "relevant or appropriate" requirements are defined in the NCP (40 CFR 300.5), as follows:

- "Applicable requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site..."

- "Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site..."

Federal and state non-promulgated standards (standards which are not of general applicability or are not legally enforceable), policies, or guidance documents, and local requirements are not ARARs. However, these criteria may be considered for a particular release when evaluating remediation necessary to protect human health and the environment.

5.3.2 Potential Chemical-Specific Requirements

The potential chemical-specific ARARs identified for remedial action alternatives at the Sesi Property include the Clean Air Act (CAA) (42 USC 7401 et. seq.), and the regulations promulgated under the CAA (40 CFR 50-80). The CAA regulates air emissions of substances that may harm public health or natural resources. Certain remedial action alternatives that may produce regulated emissions include loading, unloading, and compaction of contaminated soil, and transfer operations which may lead to volatilization of organic contaminants.

Potential chemical-specific ARARS also include:

- The Hazardous Waste Control Act (HWCA), as administered by the DTSC. The HWCA mandates the control of hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.

- The Porter-Cologne Water Quality Control Act, as administered by the State Water Resources Control Board (SWRCB) and the Water Board.

Details and descriptions of each potential chemical-specific ARARs applicable to the Sesi Property are summarized in Table 5-1.

5.3.3 Potential Location-Specific Requirements

The location-specific ARARs identified for proposed remedial alternatives at the Sesi Property include RCRA (42 USC 6091 et seq.) and the regulations promulgated under RCRA (40 CFR 240-271). RCRA regulates the generation, management, and disposal of solid and hazardous wastes.

Potential water quality ARARs for remedial action alternatives at the Sesi Property include the CWA (33 USC 1251 et seq.) and the regulations promulgated under the CWA (40 CFR 100-140 and 40 CFR 400-470). ARARs are also identified in the Safe Drinking Water Act (SDWA) (42 USC 300 (f) et seq.) and the regulations promulgated under the SDWA (40 CFR 140-149).

The CWA regulates the discharge of nontoxic and toxic pollutants into surface water by municipal sources, industrial sources, and other specific and nonspecific sources. The CWA also specified water quality criteria, requirements for state water quality standards based on these criteria, and wetlands regulations. Potential location-specific ARARs under the CWA are summarized in Table 5-1.

The SDWA specified drinking water standards, technologies, and treatment techniques for public drinking water supplies. Federal Maximum Contaminant Levels (MCLs) promulgated under the SDWA are generally used as RAOs for groundwater and ARARs for the Sesi Property. However, federal MCLs are only considered potential ARARs if the groundwater is a "current or potential source of drinking water" [40 CFR 300.430(e)(f)(I)(B)]. Groundwater quality under the Sesi Property is degraded, as evidenced by the high TDS and salinity levels (see Section 2.3.3). Groundwater beneath the Sesi Property is not suitable for drinking water use, and MCLs are neither applicable nor relevant and appropriate requirements for groundwater beneath the Sesi Property.

5.3.4 Potential Action-Specific Requirements

The potential action-specific ARARs identified for remedial action alternatives at the Sesi Property include the National Pollution Discharge Elimination System (NPDES) under the CWA. In addition, the HWCA/Mulford-Carrell Air Resources Act, as implemented by the San Diego Air Pollution Control District (SDAPCD) and administered by the California Air Resources Board, the California Safe Drinking Water and Toxic Enforcement Act, and the California Occupational Safety and Health Act (OSHA) are potential action-specific ARARs applicable for the Sesi Property. Table 5-1 provides a summary of the potential ARARs for the Sesi Property.

5.3.5 Potential "To-Be-Considered" Criteria

In addition to ARARs, other nonenforceable criteria, policies, or guidance may be used to establish remedial action objectives and screen remedial alternatives under 400 CFR 300.430(e)(2)(I). These "To-Be-Considered" criteria are listed in Table 5-1.

5.3.6 Other Federal and State Laws

Other federal laws were reviewed as potential ARARs but were judged not to contain standards or regulations pertinent to the RAOs at the Sesi Property. These laws include, but are not limited to, the Toxic Substances Control ACT (TSCA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and the National Environmental Policy Act (NEPA).

In addition, laws regulating activities based on specific historical or environmental features do not appear to be potential ARARs at the Sesi Property. These laws include, but are not limited to, the National Historic Preservation Act, the Wild and Scenic Rivers Acts, the Fish and Wildlife Coordination Act, the Wilderness Act, and the Coastal Zone Management Act.

5.4 Acceptable Soil Concentrations

Appropriate soil cleanup levels must be developed for the remediation of the ash and the auto-shredder waste at the Sesi Property under certain remedial alternatives. Accordingly, ENVIRON developed Acceptable Soil Concentrations (ASCs) for exposure to copper and lead at the adjacent Barnhart/Dantzler site (ENVIRON 1995). Because the wastes at the Barnhart/Dantzler site are similar to the Sesi Property (see Section 5.1), the same ASCs developed for the Barnhart/Dantzler site apply to the Sesi Property.

The goal of developing ASCs for the Barnhart/Dantzler site, as well as the Sesi Property, was to determine the concentrations of copper and lead in soil below which adverse health effects are not expected to occur based on certain exposure assumptions. ENVIRON assumed a residential exposure scenario using adult and child residents, because these exposure assumptions are conservative and soil concentrations acceptable for residents would also be protective of other potential future populations.

The ASC for copper was calculated based on a residential exposure scenario with an adult and a child as the exposed populations (ENVIRON, 1995). The calculated ASC for copper for the child resident was 2,500 mg/kg and the ASC for the adult resident was 23,000 mg/kg. These calculations were based on an oral Reference Dose (RfD) of 3.7×10^{-2} for copper. The RfD is a threshold exposure level below which no adverse health effects are expected.

Because an RfD has not been developed for lead, a different approach has been recommended by the California Environmental Protection Agency (Cal-EPA) and USEPA for the evaluation of potential health risk associated with lead exposure. This approach utilizes a spreadsheet, which specifies default exposure parameters and pathways. In the DTSC's Lead Risk Assessment Spreadsheet the predicted level of lead in blood as a result of exposure from site-related as well as background sources is compared with a blood lead level of concern. A clear non-observed-effect level has not been established for many adverse health effects associated with lead exposure. Dose-response curves for some of these health effects appear to extend down to a blood lead

level of 10 micrograms per deciliter (µg/dl) of whole blood (10 µg/dl) or less. The DTSC recommends the use of a blood lead concentration of concern in children and adults of 10 µg/dl. The potential health risk resulting from exposure to lead can therefore be estimated by comparing the 50th, 90th, 95th, 98th, and 99th percentile lead concentrations in blood with the blood level of concern. When the predicted lead concentration in blood is less than 10 µg/dl, an adverse health effect is not likely to occur. The calculated ASCs for lead at the Site for the 99th and 95th percentiles for adults were 4,129 mg/kg and 5,815 mg/kg, respectively (ENVIRON, 1995). The calculated ASCs for the 99th and 95th percentiles for children were 406 mg/kg and 700 mg/kg, respectively. Because the spreadsheet does not provide for calculation of the ASC for the 90th percentile, ENVIRON performed additional calculations and obtained a lead concentration of 880 mg/kg for the 90th percentile for children.

As described in ENVIRON (1995), a soil cleanup level of 2,500 mg/kg was selected for copper at the site. For lead, a soil cleanup level of 700 mg/kg was selected. According to the DTSC's Lead Risk Assessment Spreadsheet and given the conditions at the site, i.e., an assumed lead level in air of 0.18 microgram per cubic meter (µg/m^3), which is the DTSC default value, a lead concentration in water of 5 µg/l, no consumption or selling of vegetables, and a respirable dust level of 50 µg/m^3 (DTSC's default value), the DTSC is confident that 95% of the childhood population will be protected against lead at the calculated ASC for the 95th percentile, which is 700 mg/kg for the site.

ENVIRON noted that the DTSC mandates that the blood lead level in children does not exceed 10 µg/dl (ENVIRON, 1995). At the 95% UCL of the mean detected lead level in soil, which is 320 mg/kg, the blood lead levels would be 6.4 µg/dl or lower in 90% of the children, 7.2 µg/dl or lower in 95% of the children, 8.4 µg/dl or lower in 98% of the children, and 9.2 µg/dl or lower in 99% of the children, i.e., more protective than required by the DTSC. For comparison purposes, a soil lead level of 700 mg/kg would result in blood lead levels of 8.8 µg/dl, 10 µg/dl, 11.6 µg/dl, and 12.7 µg/dl in 90, 95, 98, and 99% of the children, respectively, and a soil lead level of 880 mg/kg would meet the 10 µg/dl blood lead level of 90% of the children. Therefore the DTSC is confident that the selected soil lead concentration of 700 mg/kg will not exceed the required blood lead level of 10 µg/dl in 95% of the children.

ENVIRON (1995) concluded that 700 mg/kg is a reasonable soil lead concentration for the Barnhart/Dantzler site. ENV America believes that due to strong similarities between the Barnhart/Dantzler site and the Sesi Site, the same lead level of 700 mg/kg is also reasonable for the Sesi Site. Using the lead spreadsheet, the DTSC is confident that 95% of the childhood population will be protected by this level. Protection of 95% of the population is consistent with the level used throughout the USEPA's Risk Assessment Guidance for Superfund and has typically been used at other sites. This proposed soil lead level can also be considered as highly conservative. The proposed soil level may actually result in greater than 95% of the childhood population having blood lead levels at 10 µg/dl or lower if site-specific data for air lead levels is put into the model. The input for lead in air, 0.18 Fg/m^3, is a value that, according to monitoring data in the San Diego area, is 10-fold higher than the actual lead air level as monitored by the California Air Resources Board in the San Diego area. Had the actual lead air concentration been used in the Lead Risk Assessment, the allowable level of lead in soil would be approximately 10% higher.

6.0 IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL ALTERNATIVES

This section describes the identification and screening process used to evaluate remediation alternatives that were considered for the Site. The CERCLA requires the selection of a remedial action that is protective of human health and the environment. The USEPA policy is that ARARs should be identified and attained to the extent practicable. Remedial action goals have been developed for the Sesi Property, as discussed in Section 5.0 of this report.

6.1 Identification of Alternatives

The review of remedial alternatives was conducted using guidelines contained in the federal NCP. The NCP establishes criteria and factors to be used in assessing the types of remedial action that may be appropriate for site cleanup, and are followed at sites under federal supervision.

The NCP states that, prior to the remediation of a site, a number of alternative remedial approaches should be investigated and evaluated. The NCP requires that the analysis of alternatives must also include the consideration of a no action alternative. Accordingly, the following alternatives are identified for the Site:

- No Action;
- Capping;
- Excavation and offsite disposal;
- Stabilization/solidification; and,
- Recycling.

Each alternative is briefly described in the following sections.

No Action

The no action alternative may be appropriate when it can be demonstrated that human health and the environment can be adequately protected without remediation.

Capping

Containment of the ash and the auto-shredder waste by capping is another process that could be used at the Sesi Property to cover the ash and the auto-shredder waste with a low-permeability cap system. The primary purpose of the cap is to practically eliminate surface dispersal of the ash and the auto-shredder waste, and to substantially reduce infiltration of surface water. Various engineered cap alternatives are available and categorized in the three following groups:

- Rigid cap, such as a concrete cap;
- Semi-rigid cap, such as asphalt paving; and,
- Flexible cap, such as clay, geosynthetic membrane, and geosynthetic clay liners.

The rigid and semi-rigid caps are not considered any further due to the fact that settlement of fill materials are expected due to the thickness of fill and settlement tolerance of the rigid and semi-rigid caps are very minimal. In addition, the adequacy of these caps for slopes is questionable. Other than the cost factors involved in installation of these caps, continuous cracking will develop and maintenance of the cap is required.

The flexible cap system should generally be constructed in accordance with the requirements of Section 21090, Title 27 of CCR. Table 6-1 - Comparison of Final Cover Alternatives, shows the type of flexible cap alternatives available for the Site. Due to availability of clayey soil near the Site, cost, and slope stability issues, only the 1-foot thick low permeability clay layer alternative (clay/vegetative cap) was considered for this Site. The cap would be composed of a 2-foot thick foundation layer (which can consist of the ash), a minimum 1-foot thick layer of imported low-permeability (clay) material, and a minimum 1-foot thick vegetative layer. The primary purpose of a clay/vegetative cap is to practically eliminate infiltration of surface water.

Excavation and Offsite Disposal

Offsite disposal involves excavation of the ash and the auto-shredder waste, transportation of the excavated materials offsite, and the disposal of the transported materials in an appropriate facility. Because the ash is classified as nonhazardous waste, it can be deposited at a Class III landfill, if excavated. Furthermore, because the auto-shredder waste is considered a special waste, by regulation it can be deposited in a Class III landfill, if excavated. Part of the excavated areas would need to be backfilled for safety reasons.

Stabilization/Solidification

The USEPA has defined stabilization as a technique that reduces the hazard potential of a waste by converting the contaminants into their least soluble, mobile, or toxic form. The physical nature and handling characteristics of the waste are not necessarily changed by stabilization (USEPA, 1986). According to the USEPA, solidification refers to techniques that encapsulate the waste in a monolithic solid of high structural integrity. The encapsulation may be of fine waste articles (microencapsulation) or of a large block or container of wastes (macroencapsulation). Solidification does not necessarily involve a chemical interaction between the wastes and the solidifying reagents, but may mechanically bind the wastes into the monolith. Because the ash has been classified as a nonhazardous waste, and solidification is not applicable to most of the shredder pieces found in the auto-shredder waste, the solidification alternative is not considered any further.

Recycling

Another alternative considered, but rejected, is recycling the ash and the auto-shredder waste into a useable product. Asphalt incorporation is a process whereby soil can be used as aggregate to manufacture asphaltic concrete. Incorporation of the ash into asphalt was omitted from further consideration because of: (1) concern regarding the possible inability of this alternative to reduce soluble copper and lead concentrations to below the STLCs of copper and lead in the final product, and (2) implementability (lack of identification of a suitable contractor to implement this alternative). Furthermore, incorporation of the auto-shredder waste into asphalt was considered not feasible because of the presence of hoses, belts, wires, fixtures, pipes, concrete slab, and similar debris in the auto-shredder waste.

Based on the foregoing, the following three alternatives were identified for the further evaluation for Sesi Property:

- No action;
- Clay/vegetative cap; and,
- Offsite disposal.

6.2 Detailed Description of Alternatives

6.2.1 General

In the following paragraphs, a detailed description of the alternatives identified in Section 6-1 is presented.

6.2.2 No Action

The highest total copper and lead concentrations detected in the ash, as discussed in Section 3.1.3, are 1,000 mg/kg and 560 mg/kg, respectively. These concentrations are lower than the ASCs developed by ENVIRON (ENVIRON, 1998) for the neighboring Bernhart/Dantzler site, which is similar to the Sesi Property. The ASCs are 2,500 mg/kg for copper and 700 mg/kg for lead (see Section 5.4). The highest total copper and lead detected in the auto-shredder waste, as presented in Section 3.2, are 2,340 mg/kg and 5,600 mg/kg, respectively. Furthermore, several samples of the auto-shredder waste contained total concentrations of lead exceeding 700 mg/kg. The highest detected total concentration of copper is lower than the 2,500 mg/kg ASC for copper. However, several of the detected total concentrations of lead are higher than the 700 mg/kg ASC for lead developed for the site.

The goal of developing ASCs was to determine whether the copper- and lead-containing ash and auto-shredder waste identified at the Sesi Property can be left in-place unmitigated, without potential adverse health effects to the site's residential population. Based on the foregoing results (specifically the high total lead concentrations of the auto shredder waste), the no action alternative is not an acceptable alternative for the auto-shredder waste at the Sesi Property.

6.2.3 Clay/Vegetative Cap

The clay/vegetative cap alternative consists of leaving the ash and the auto-shredder waste in-place and constructing a cap system over them to reduce the infiltration of rain and other surface water that would cause the downward migration of the COCs and protect against surface exposures to the ash and the auto-shredder waste and dust generated by them. The clay/vegetative cap appears to potentially be a suitable remedy for the onsite ash and auto-shredder waste.

The prescriptive requirements for a clay/vegetative cap are described in Title 27 of CCR, entitled "Closure and Post Closure Maintenance Requirements for Solid Waste Landfills." As with any other remedial alternative, the DEH, the Water Board, and the CIWMB will require review of plans for the implementation of a clay/vegetative cap.

6.2.4 Offsite Disposal

As part of this alternative, the ash and the auto-shredder waste would be excavated and hauled to an offsite facility for disposal. A Class III landfill can be used for the disposal of the ash because the ash is classified as nonhazardous waste. However, while the auto-shredder waste is considered a special waste and by regulation can be deposited in a Class III landfill, the Otay Annex Landfill in Chula Vista in San Diego County, which is the closest Class III landfill to the Site, as well as other landfills in the area, are reportedly unwilling to accept special waste. Following the completion of the ash and the auto-shredder waste removal operations, the excavation would need to be partially backfilled and compacted with clean soil. Disposal at a landfill carries with it the long-term liabilities associated with the landfill. Also, excavation of waste will result in the increased emissions of airborne contaminants.

6.3 Screening of Alternatives

6.3.1 Evaluation Criteria

The alternatives were evaluated using nine criteria given in the NCP and described in USEPA (1988). These evaluation criteria are as follows:

1. Overall protection of human health and the environment;
2. Compliance with ARARs;
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment;
5. Short-term effects;
6. Implementability;
7. Cost;
8. Regulatory agency acceptance; and,
9. Community acceptance.

Criteria 3 through 7 listed above are the primary balancing criteria upon which the analyses are based, as they address technical, economic, and institutional concerns. Criteria 1 and 2 are threshold criteria related to statutory findings and risk concerns, and they draw on information developed under the five following criteria (i.e., Criteria 3 through 7). Criteria 8 and 9 are modifying criteria and are contingent upon agency and public comments, and they could only be evaluated to a limited extent at this stage.

The NCP criteria are briefly described in the following paragraphs.

Overall Protection of Human Health and the Environment

This criterion is based on a composite of other factors assessed under the other evaluation criteria, especially short- and long-term effectiveness and compliance with ARARs. It addresses specifically how each remedial action alternative achieves protection over time and how site risks are reduced.

Compliance with ARARs

Compliance with ARARs evaluates whether each alternative will meet all of its federal and state ARARs that were identified in Section 5.0.

Long-Term Effectiveness and Permanence

This evaluation criterion addresses the results of a remedial action in terms of the risk remaining at the Site after the response objectives have been met. The primary focus of this evaluation is the effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The following components of this criterion were addressed for each alternative:

- Magnitude of remaining risk and cleanup;
- Adequacy of control; and,
- Reliability of controls.

Reduction of Toxicity, Mobility, and/or Volume through Treatment

This evaluation criterion addresses the effectiveness of the remedial action in reducing the toxicity, mobility, and/or the volume of hazardous substances left at a site. This criterion is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of the total volume of contaminated media. The following factors of this criterion were addressed for each alternative:

- The treatment processes to be used, and the materials to be treated;
- The amount of hazardous materials to be treated;
- The estimated degree of expected reduction in toxicity, mobility, or volume;
- The degree to which the treatment is irreversible; and,
- The type and quantity of treatment residuals expected to remain after treatment.

Short-Term Effects

This evaluation criterion addresses the effects of the remedial action during the construction and implementation phase prior to the completion of the remedial response objectives. Under this criterion, alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors of this criterion were addressed for each alternative:

- Protection of the community health during the remedial action;
- Protection of workers health during the remedial action;
- Time until remedial response objectives are achieved; and,
- Environmental impacts (adverse impacts to the environment as a result of remedial activity).

Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing a remedial action alternative and the availability of various services and materials required during its implementation. This criterion involves analysis of the following factors:

- Technical feasibility, in regard to feasibility of construction and operation of the alternative, the reliability of the technologies composing the alternative, the ease of undertaking additional remedial action, and the ability of monitoring the effectiveness of the remedy;
- Administrative feasibility, such as operating permits, implementing institutional controls; and,
- Availability of services and materials.

Cost

The cost criterion evaluates remedial action alternatives based on economic considerations, which primarily consist of cost estimates derived for each alternative. The cost of construction and long-term costs (i.e., operation and maintenance [O&M] or monitoring) are considered under this criterion.

Regulatory Agency Acceptance

This criterion addresses the technical and administrative issues and concerns that the regulatory agencies may have regarding each of the alternatives. The DEH and City of San Diego Development Services Department reviewed prior draft versions of this RAW and the Initial Study. This RAW and the Initial Study (Chambers, 2005) incorporate prior agency review comments received from the DEH and the City of San Diego.

This criterion will be addressed again after comments on the RAW are received from the public.

Community Acceptance

This criterion is designed to evaluate the issues and concerns that the public may have regarding each of the final candidate alternatives. This criterion will also be addressed after comments on the RAW have been received from the public.

6.3.2 Preliminary Screening and Selection of Remedial Technologies

To narrow the remediation technologies described in Section 6-1, the technologies were preliminarily screened using the following three criteria:

- Effectiveness;
- Implementability; and,
- Cost.

Evaluating the effectiveness of the technology involved two considerations:

1) Whether implementing the technology causes adverse environmental effects; and,
2) Whether the technology has sufficient capabilities relative to the objectives and associated performance requirements.

If either consideration produced an unsatisfactory finding, the technology option was not considered further. Long-term effectiveness was evaluated in terms of the ability of a technology to perform intended functions for the overall protection of human health and the environment. It included consideration of reduction of toxicity, mobility, and volume of the ash through treatment.

Implementability was evaluated in terms of the ease of installation (constructability) and the time required in order to achieve the desired level of response. Technical feasibility was considered to determine if the technology is feasible for the Site and whether the technology has been used for remediation of other sites with similar conditions.

Technologies that are significantly more costly than other technologies without providing a greater degree of benefit or reliability should be excluded from further considerations. For this criterion, both construction and post-construction costs were included.

The no action alternative was omitted from further consideration because as noted in Section 6.2.2, the concentration of lead in the auto-shredder waste exceeds the ASC for lead developed by ENVIRON for the neighboring Barnhart/Dantzler site, which is similar to the Sesi Site. Therefore, preliminary screening of the alternatives described in Section 6.2 resulted in the selection of the following two alternatives for additional evaluation for the selection of a combined remedy for the ash and the auto-shredder waste at the Site:

- Clay/vegetative cap; and
- Excavation and offsite disposal of the ash and the auto-shredder waste in a Class III landfill.

7.0 EVALUATION OF REMEDIAL ALTERNATIVES

This section describes and evaluates the two retained alternatives described in Section 6.0. As a result of the screening process described in Section 6.0, the following two alternatives were identified for further analysis:

- Alternative 1 - Clay/vegetative cap; and,
- Alternative 2 - Excavation and offsite disposal of the ash and the auto-shredder waste.

According to the NCP, after the preliminary screening analysis is completed, a detailed analysis is required for all alternatives that present a viable approach for remediation. This analysis consists of an assessment of the individual alternatives against the NCP evaluation criteria and a comparative analysis that focuses upon the relative performance of each alternative against those criteria, as presented in 40 CFR 300.430(e)(9).

The relative performance of each alternative against the NCP criteria was evaluated so that the advantages and disadvantages of the alternatives could be weighed. In this process, the first two NCP evaluation criteria, overall protection of human health and the environment and compliance with ARARs, served as "threshold" determinations that must be satisfied before an alternative can be selected as a proposed remedy (USEPA, 1988).

The next five NCP criteria are: long-term effectiveness and permanence (which refers to the period after the remedial action is complete); reduction of toxicity, mobility, or volume through treatment; short-term effects (which refers to the construction and implementation period); implementability; and cost served as the balancing criteria. A comparison of the relative advantages and disadvantages of the alternatives as qualified by the above criteria allow evaluation of the remedy alternatives that best meet the remedial action objectives and suit the needs of the project. The following paragraphs present the evaluation of the above-mentioned alternatives with respect to the NCP criteria.

Overall Protection of Human Health and the Environment

For both of the alternatives, the onsite and offsite construction workers who come in contact with the waste would have a risk of exposure to chemicals in the waste materials. Dust may be generated and odors/vapors potentially may be released from the exposed soil. Such exposure risks will be much higher for Alternative 2 due to much longer and higher level of construction activities. The estimated time that the remediation workers would be exposed to waste material during the implementation of Alternative 1 is much shorter and will be further minimized by using dust suppression techniques during the construction activities. Therefore, Alternative 1 would provide a much better overall protection of human health and the environment.

Compliance with ARARs

Both alternatives will achieve the RAOs and will be in compliance with ARARs. By proper design and implementation of construction activities, including excavation, transportation, and backfilling/compaction, the action-specific ARARs will be met for both alternatives.

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence are essentially the same for both alternatives in terms of the waste. The two alternatives involve the landfill disposal of the waste; the difference is the location of long term disposal. Offsite disposal would improve the onsite conditions, and transfer the waste storage maintenance and monitoring to another location.

Reduction of Toxicity, Mobility, and/or Volume through Treatment

Both alternatives do not provide for reduction in toxicity or volume of waste. Mobility of waste in an onsite or offsite landfill would essentially be the same, assuming a final cover is constructed at either location.

Short-Term Effects

The excavation and offsite disposal for Alternative 2 will increase short-term impacts to the environment due to dust and vapor emissions from the significantly greater volume of waste excavation. Additionally, short term impacts to the community would result from the truck traffic during waste hauling operations. However, the estimated time for the implementation of Alternative 1 is much shorter, and Alternative 1 would involve less truck traffic. Therefore, Alternative 1 would have a much smaller short term effect.

Implementability

Both alternatives are technically and administratively feasible. The construction materials and qualified contractors are readily available for either excavation and hauling or onsite capping. There are established state and local permitting procedures for either onsite or offsite disposal.

A more detailed cost analysis is required to finalize the comparison of the two alternatives. The estimated costs for design, permitting, construction and long term maintenance and monitoring are provided in Section 7.1, below. The selection of a recommended remedial action is provided in Section 7.2.

7.1 Cost Analysis

Estimated costs are presented in the following subsections for each of the two alternatives.

7.1.1 Clay/Vegetative Cap

The assumptions used to develop cost estimates for the capping alternative, and the estimated costs, are as follows.

- Preconstruction design and consulting engineering costs are estimated to be approximately $30,000 and include:
    - Interaction with the DEH and the City of San Diego;
    - Performing hydrological studies and designing the cap system;
    - Submitting the RAW and Initial Study (Chambers, 2005), and obtaining approval from the DEH;
    - Permitting (e.g., for grading from the City of San Diego and for dust control for the SDAPCD, if required);
    - Preparing bid documents for selecting contractors, and negotiating with and selecting the contractor;
    - Performing test pad and/or other permeability tests on the low-permeability material;
    - Interaction with the Coordinating Committee, property owners, and other involved parties;
    - Planning and coordination of job startup with the contractor;
    - Site observation and documentation of field activities; and,
    - Report preparation.

- Construction costs are estimated to be approximately $565,000 and include the following components and assumptions.

  - The surface area of the clay/vegetative cap that is required to cover the identified ash and auto-shredder waste at the Site is estimated to be approximately 4.5 acres.

  - The foundation layer will be a minimum of 2-feet thick. The compacted foundation layer will have a volume of 13,600 cubic yards. The construction of this layer can be done using onsite soil at a unit cost of approximately $3.00 per cubic yards.

  - The low permeability layer will be a minimum of 12 inches thick. The compacted low permeability layer will have a volume of approximately 11,900 tons. Imported clay will be required for the construction of this layer. The cost of imported clay can vary widely depending on availability of the material and the distance it has to be transported. A unit cost of approximately $5.00 per ton was used for the material, transportation onto the Site and compaction.

  - The vegetation layer will be a minimum of 1.5 feet thick. This layer will have a volume of 11,000 cubic yards. Imported or select onsite borrow for cover soil will be required for the construction of this layer. A unit cost of $3.00 per cubic yard for the vegetation material was used.

  - The construction of a buttress requires excavation and backfill of approximately 12,000 cubic yards of soil with an estimated unit price of $3.50 per cubic yard.

  - The cost of constructing the surface water management, including channels, liners, riprap, pipes, silting basin, and gabions, is estimated to be $200,000.

  - The cost of dewatering and water management during the construction of the cap is estimated to be $100,000.

  - A cost of $50,000 is used for construction quality assurance.

  - Contractor mobilization and demobilization cost and Site restoration cost is estimated to be approximately $40,000.

- Post-closure monitoring and maintenance costs were estimated to be approximately $25,000 for the first year, and $15,000 for the next five years, and on average approximately $10,000 annually for the next 24 years. These costs will consist of (1) O&M costs, and (2) groundwater, and possibly leachate, monitoring costs, as summarized below.

Estimated Annual Post-Closure Costs

	Year 1	Years 2-6	Years 7-30
Inspection and Reporting	$ 4,000	$ 4,000	$ 4,000
Final Cover Maintenance	10,000	4,000	2,500
Drainage Maintenance	2,000	2,000	1,500
Vegetation Maintenance	4,000	3,000	1,000
Groundwater/Leachate Monitoring	5,000	2,000	1,000
Annual Total	$25,000	$15,000	$10,000

A separate contingency fund would be established for leachate treatment and disposal, which cannot be estimated until the liquid collection system is constructed and evaluated.

Therefore, the total estimated cost of the capping alternative is as follows:

Design and Consulting Services	$ 30,000
Clay/Vegetative Cap Construction	565,000
O&M and Monitoring (30 years, if necessary)	340,000
Total	$935,000

7.1.2 Offsite Disposal

The assumptions for developing cost estimates for the disposal of the ash, auto-shredder waste, and impacted native soil at a Class III landfill are as follows.

- Consulting engineering costs were estimated to be approximately $30,000 and include:
  - Interaction with the DEH and the City of San Diego;
  - Submitting the RAW, and Initial Study (Chambers, 2005), and obtaining approval from the DEH;

- Permitting (e.g., for grading from the City of San Diego and for dust control from the SDAPCD, if required);
- Preparing bid documents for selecting contractors, and negotiating with and selecting the contractor;
- Interaction with Coordinating Committee, property owners, and other involved parties;
- Planning and coordination of job startup with the contractor.
- Site observations, dust control, confirmation soil sampling, and documentation of field activities; and ,
- Report preparation.

- Excavation and disposal costs for the ash and the auto-shredder waste are estimated to be between approximately $7,295,000 to $10,765,000, and include the following components and assumptions.

  - The rate of $45/ton was assumed for the tipping fee at the Allied Waste Industries Otay Annex Solid Waste Facility (Otay Annex Landfill), which is a Class III landfill located at 1800 Maxwell Road, Chula Vista, California. The rate assumes that the ash and auto-shredder waste can be disposed at the same rate as municipal solid waste, and there is no guarantee that the same rate can be negotiated for waste from the Site. We assume that Otay Annex Landfill would accept the waste. If it was necessary to ship to another landfill, then transportation and tipping fees would be higher.

  - The estimated volume of the excavated ash would be 26,000 to 56,000 cubic yards (Table 1-1). Excavation of this volume, at an assumed unit rate of $3.00 per cubic yard of excavated ash, was estimated to be approximately $78,000 to $168,000. The estimated volume of the excavated auto-shredder waste is estimated to be 35,000 to 77,000 cubic yards. Excavation of this volume, at an assumed unit rate of $3.00 per cubic yard was estimated to be approximately $105,000 to $231,000. The estimated volume of 80,000 to 90,000 cubic yards of native soil was also used during waste placement (Hargis, 1994). It is assumed that 60,000 cubic yards of the native material is also impacted as a result of contact with auto-shredder and ash material. Excavation of this volume, at an assumed unit rate of $3.00 per cubic yard was estimated to be approximately $180,000.

- The estimated weight of the excavated ash would be 36,000 to 78,000 tons. Loading, offsite transportation to Otay Annex Landfill, and unloading at the landfill, at an assumed unit rate of $7.00 per ton, was estimated to be approximately $252,000 to $546,000. The estimated weight of the excavated auto-shredder waste and impacted native soil is between approximately 114,000 and 164,000 tons. Loading, offsite transportation to the Otay Annex Landfill, and unloading at the landfill, at an assumed unit rate of $7.00 per ton, was estimated to be approximately $798,000 to $1,148,000.

- Landfill disposal fee for the disposal of the excavated ash, auto-shredder waste, and impacted soil in the Otay Annex Landfill, at an assumed unit rate of $45.00 per ton, was estimated to be approximately $6,750,000 to $10,890,000.

- Imported soil would be required for the backfilling of the excavated areas. Using an assumed unit cost of $5.00 per ton for the onsite material, and compaction, it was estimated that this task could be done for a total cost of approximately $150,000 (approximately 30,000 tons).

- Dewatering during the excavation would be required. Assuming removal, onsite treatment, and disposal of 2,000,000 gallons of water, the cost will be approximately $200,000.

- Contractor mobilization and demobilization cost and Site restoration cost is estimated to be approximately $30,000.

- Post-construction costs were estimated to be approximately $50,000 and include the construction of four wells, and groundwater monitoring (groundwater sampling and analysis and reporting) for four quarters. No O&M is required for this alternative.

Therefore, the total estimated cost of the offsite disposal alternative for the ash, auto-shredder waste, and impacted native soil, and assuming that one year of groundwater monitoring is required, is as follows:

Consulting Services	$	30,000
Excavation and Disposal	8,393,000 to	13,393,000
Backfilling and Compaction		150,000
Well Construction		20,000
Groundwater Monitoring (1 year)		30,000
Total	$8,623,000 to	$13,623,000

7.2 Comparative Cost of Alternatives

A comparison of the costs of these alternatives is presented below.

Clay/vegetative cap	$ 995,000
Disposal at a Class III landfill	$ 8,623,000 to $13,623,000

These estimated costs do not include any contingencies. Contingencies are required to provide for uncertainties in (1) the design parameters and estimated unit costs for the construction of the clay/vegetative cap alternative, and (2) the estimated volume and weight of the ash and the auto-shredder waste, cost of disposal at a Class III landfill, the availability and cost of imported soil for backfilling, and loading and transportation unit costs, and compaction costs for the offsite disposal alternative. For the above two alternatives, contingencies are required for the added costs associated with potential delays due to rain and other factors.

7.3 Selection of Remedial Action

ENV America recommends the clay/vegetative cap remedy for the ash and the auto-shredder waste at the Site. The primary purpose of the cap is to practically eliminate runoff of the ash and the auto-shredder waste from the Site. The cap will also substantially reduce infiltration of surface water into the groundwater. This alternative is effective because it minimizes residual risks and maximizes long-term protection, minimizes short-term impacts, and increases the speed with which protection is achieved. This alternative is technically feasible and readily available. Long-term groundwater monitoring may be required by the agencies.

This alternative provides an overall protection of human health and the environment, and meets NCP relevant criteria. In contrast, the other alternative (excavation and offsite disposal) is unreasonably expensive, and scores very poorly on short-term effectiveness due to extensive construction activities which could expose workers and community to the buried waste through dusts and atmospheric dispersion.

Furthermore, the cap alternative for the Sesi Site is consistent with the capping of adjacent waste of the Barhart and Danzler properties, a remediation that was approved by the DEH in 2000.

8.0 ENGINEERING PLAN FOR THE FINAL COVER

8.1 Introduction

The goals of the final cover design are to limit water infiltration, to isolate the wastes, promote drainage by appropriate surface grades, minimize erosion or abrasion of the cover, and accommodate settlement or subsidence while maintaining the integrity of the cover. The cover system design for the Sesi Property was based on evaluations of existing Site conditions, availability of low permeability cover materials in the vicinity of the Site, and feasibility and cost of alternative cover systems. The conceptual design criteria are based in part on information presented in our Geotechnical Report (ENV America, 1996a). Plans and details of the proposed construction are illustrated on the Construction Plans, which are included here (see figure tab of this report). The factors considered in the final cover design are presented below.

8.2 Evaluation of Existing Conditions

The existing conditions of the waste fill surface were evaluated by ENV America. Field inspections and investigations by ENV America indicated that the waste fill is presently covered with an uncompacted soil layer from less than 1 to as much as 5 feet thick. Scattered surface debris is common, including auto shredder waste, asphalt, and concrete rubble. Grasses and shrubs sparsely cover most of the present waste cover surface.

Topography of the top deck is generally irregular, including flat areas and localized depressions. The principal run-on flows enter the Site from a 48-inch reinforced concrete pipe (RCP) under Cactus Road. These run-on flows enter a closed basin at the Site, approximately 4 feet deep, located between the waste fill and Cactus Road. Overflow from the basin and other drainage at the Site are not controlled by defined drainage structures. The slope above Spring Canyon at the southwestern edge of the waste fill is highly eroded.

8.2.1 Limits and Quantities of Waste

ENV America conducted a field investigation to define the lateral and vertical extent of waste on the Site. This investigation included review of aerial photographs, field mapping, and a subsurface investigation that included the drilling of eight borings and excavation of three trenches. Detailed descriptions of the investigations are presented in the Geotechnical Report (ENV America, 1996a).

The location and limits of the waste fill identified as a result of the above exploration programs are shown on Figures 2-1 through 2-4, and the limits of the proposed final closure cover are indicated in Sheets 4 and 5 of the Construction Plans.

Several estimates for the quantities of waste by type have been prepared by others as summarized in Table 1-1. The total volume of soil and waste was estimated to be 160,000 cubic yards by EAV (1991). In addition, EAV has estimated about 42,000 cubic yards of soil have been placed during landfill operations and as part of the interim soil cover.

8.3 Regulatory Requirements for Final Cover

The criteria used to design the final cover and to evaluate the various layers of the final cover are based on selected, relevant sections of the CCR (Title 27) and 40 CFR Parts 257 and 258 Solid Waste Disposal Criteria Final Rule of 1991 (Subtitle D) of the RCRA. Not all the requirements stipulated by these regulations are applicable to the Site, and depending on the situation, one regulation may be more stringent than another. Subtitle D requires a minimum of a 1½-foot-thick cover having a permeability less than or equal to that of the bottom liner or underlying natural subsoils or no greater than 10^{-5} cm/sec, whichever is less. The design presented herein, however, is based on the more stringent requirements of CCR Title 27, which requires either a 1-foot-thick clay cover with a hydraulic conductivity less than or equal to 1.0×10^{-6} cm/sec, or a cover with hydraulic conductivity equal to the bottom liner system or underlying natural geologic materials, whichever is less. Table 8-1 - Final Cover Material Requirements, summarizes the minimum requirements of Title 27 and RCRA Subtitle D. Because a bottom liner is not present in the waste fill, the hydraulic conductivity of the final cover low permeability layer should be governed by that of the Otay Formation bedrock underlying the waste. Slug tests were conducted by ENV America (refer to Hydrogeology Report, ENV America 1996b) to estimate the hydraulic conductivity of the bedrock underlying the waste fill. These tests indicated a range in the hydraulic conductivity from 2×10^{-2}cm/sec to 6×10^{-5}cm/sec, depending on the boring location and method of analysis. Using these test results, we estimate that the average hydraulic conductivity of the geologic materials underlying the waste is greater than 5.0×10^{-6} cm/sec.

Based on the Site conditions, the hydraulic conductivity criteria in Title 27 of the CCR, requires a 1-foot-thick clay layer with a hydraulic conductivity of 1 x 10^{-6} cm/sec or less. The minimum design requirements stated in CCR Title 27 are summarized below.

- **Foundation Layer:** A 2-foot-thick layer consisting of soil, impacted soil, ash or other waste materials, provided that such materials have appropriate engineering properties, shall be placed on top of the waste. The foundation layer shall be compacted to the maximum density obtainable at optimum moisture content using methods that are in accordance with accepted civil engineering practices.

- **Low Permeability Layer:** A 1-foot thick soil cap containing no waste or leachate shall be placed on top of the foundation layer and compacted to attain a hydraulic conductivity of 1 x 10^{-6} cm/sec or less, or equal to the hydraulic conductivity of any bottom liner or system or underlying natural geologic materials, whichever is less.

- **Vegetative Layer:** A topsoil layer containing no waste or leachate shall be placed on top of the soil cap with sufficient thickness to contain the rooting depth of vegetation proposed on the cover, but not less than 1 foot in thickness.

- **Cover Slope:** In order to prevent ponding, the closed landfill shall be graded and maintained to divert precipitation runoff away from the landfill cells, by providing at least a minimum slope of 3 percent or an effective system to direct surface drainage away from covered wastes. The grading and cover maintenance program should enable the closed landfill to resist erosion from a 100-year, 24-hour storm.

8.4 Cover Alternatives

Since one of the primary functions of the cover system is to minimize percolation of precipitation through the cover system and into the underlying waste, two main categories of cover design were evaluated as discussed in this section: (1) a design identical to that prescribed in Title 27; and (2) an alternate design that would meet the intent of Title 27. Both of these design categories include a 2-foot thick foundation layer as required in Title 27, but differ in the design of the low-permeability layer. The alternatives considered included the Design prescribed in Title 27 with a 1-foot-thick low permeability layer consisting of imported clay from an offsite source and a 1½-foot-thick vegetative layer.

The final cover design as specified in the Sesi Property closure documents follows the general requirements of CCR Title 27. The minimum thickness for the vegetation layer was selected as 1.5 feet to accommodate rooting depth of drought tolerant perennial shrubs and grasses common to the region, and to minimize long-term maintenance costs for repairs of the low permeability layer due to shallow erosional rilling.

8.5 Clay Borrow Source Evaluation

ENV America evaluated several clay borrow sources in the area as part of its closure plan. No significant clay mines are known to exist in the immediate area. A potential borrow source was identified, consisting of clay soil stockpiles at the Otay Annex Landfill.

The stockpiles were created during grading at the landfill property (Otay Annex) for landfill expansions. The source is understood to include surficial soil (alluvium and colluvium), and bedrock of the Otay Formation. The clay sources include the southeast and east stockpiles located in the eastern portion of the property (see Figure 8-1 - Otay Annex Stockpile Location). These stockpiles are estimated to contain sufficient soil to complete the Sesi Closure Project.

The southeast stockpile soil has been sampled and tested on two occasions. A study by Corroll, Chapin and Arevalo, Inc. (Corroll, 1994), included laboratory investigation and field permeability testing by the sealed double ring infiltrometer (SDRI) of a clay test pad, constructed from soil obtained from the stockpile. In addition, ENV America has performed sampling and laboratory evaluations in 1995 on the southeast stockpile as reported herein. A summary of the geotechnical index properties and laboratory permeability values are provided on Table 8-2 - Otay Annex Landfill Stockpile Clay Test Data. Laboratory tests included soil classifications, grain size distribution, Atterberg limits, modified proctor compaction, and triaxial permeability.

Based on a review of the test data, soil within the southeast stockpile varies from clayey sand to highly plastic clay, with fines content (percent passing the #200 sieve) ranging from 46 to 73 percent. Corroll conducted 7 permeability tests on remolded samples obtained from the stockpile. The results ranged from 1.5×10^{-6} cm/sec to 6.5×10^{-8} cm/sec for samples remolded to 90 percent relative compaction. Included in the data in Table 8-2 are the results for one test on Sample SF 4-7 that was screened over a No. 4 sieve during sample preparation. Our experience at other landfills suggests clay clods as observed in samples from the stockpile would be excluded during screening and only the sand and silt fractions would predominate. This resulted in an anomalously high permeability value (1.6×10^{-6} cm/sec) compared to other tests on the same sample where no screening was performed, and is therefore not considered relevant for the purpose of this study.

Corroll also performed testing on a clay test pad constructed of soil obtained from the stockpile. The test pad was constructed in the following manner:

- Dimensions of the pad were 50 feet wide, 100 feet long, and 2 feet deep.
- A temporary stockpile was created from hauled clay. The soil was pulverized by a Bomag asphalt recycler and moisture conditioned prior to final hauling to the test pad.
- Moisture content was ultimately controlled to 2 percent above optimum, to achieve the specified compaction. Attempts to achieve compaction at higher moisture contents failed.
- Soil lifts were compacted by a CAT 825 to 95 percent relative compaction.

Drive samples taken from the test pad (Table 8 -2, Samples P-1 through P-4) were tested for triaxial permeability. The permeability of these samples ranged from 9×10^{-6} to 7.5×10^{-8}cm/sec. In addition, a sealed double ring infiltration test was performed. After 44 days of monitoring, an infiltration rate of 8.2×10^{-7} cm/sec was calculated. Reduction of data to calculate the associated permeability values was not performed by Corroll et. al. Using the reported wetting front advancement of 9 inches and an approximate depth of water in the test apparatus of 12 inches, a hydraulic gradient of 2.3 can be calculated, which would provide a permeability value of about 3×10^{-7} cm/sec. This would be a conservative, upper-end value, as soil swelling and soil suction were not measured or evaluated during the test and could not be used in the calculations.

In 2001, an additional clay source area at the Otay Annex Landfill was sampled and tested, and identified as the east stockpile on Figure 8-1. Test results on representative samples from the east stockpile (Table 8-2) indicate the soil varies from clayey sand to low plastic clay, with fines content ranging from 28 to 62 percent. The soil was derived from excavations of Otay Formation bedrock. These materials are expected to be suitable for constructing the low-permeability layer at the Site. However, quality assurance and quality control (QA/QC) monitoring must be employed at the stockpile to exclude soil with a fines content of less than 30 percent from being hauled to the Site for processing.

To evaluate the relationship between moisture content during remolding and permeability, ENV America conducted a series of tests on remolded samples obtained from the southeast stockpile. The soil utilized had an optimum moisture content (OMC) of 16.0 percent. Four samples were prepared, two samples at 2 percent above OMC and one sample each at 4 and 6 percent above OMC. Specimens representing the 3 moisture contents were remolded to 90 percent relative compaction and tested for triaxial permeability (ASTM D5084) under a confining pressure of 5 psi. The remaining sample at 2 percent above OMC was remolded at 95 percent relative compaction and tested for permeability under the same methods and conditions. The permeability test results and index soil properties are shown on Table 8-2, and a graph of permeability versus moisture content is shown on Figure 8-2 - Permeability Versus Moisture Content. Laboratory test reports are presented in Exhibit A - Geotechnical Laboratory Data.

A review of Figure 8-2 suggests that when remolded to 2.5 percent above OMC, suitable permeability results, values less than 1.0×10^{-6} cm/sec, are achieved. By selecting a minimum moisture content of 3 percent above OMC for the construction specifications, remolded permeabilities of about one-half an order of magnitude better (less) than 1.0×10^{-6} cm/sec should be achieved. In addition, our experience has shown that improved permeability test results can be achieved provided:

- The soil is processed by pulvi-mixer type equipment such as a Bomag MPH 100. Two passes per lift are generally sufficient to blend soil with added water and to reduce soil particle (clod) sizes.

- A minimum of 48 hours of curing following processing and prior to placement and compaction is specified.

8.6 Cover Design and Construction

8.6.1 General

The proposed final cover system for the surface of the waste fill complies with Section 21090 of CCR Title 27. The system consists of a minimum 2-foot-thick foundation layer, a minimum 1-foot-thick low permeability (permeability less than 1 x 10^{-6} cm/sec) layer, and a minimum 1½-foot-thick top vegetative layer. The 1½-foot thickness of the proposed topsoil layer exceeds the minimum Title 27 CCR requirement of 12 inches, but will reduce the possibility of desiccation cracking in the low permeability layer and is better suited to accommodate the root penetration of the vegetation under consideration for use at this landfill. The foundation layer will be significantly thicker than the minimum requirement of 2 feet in certain areas due to design criteria for the maintenance of the minimum 3 percent slope and to provide larger areas of uniform grades to simplify construction.

The final grading plan developed on the basis of this cover system design is presented in Section 11.2 and as shown on Sheet 5 of the Construction Plans.

8.6.2 Quantities of Cover Materials

The proposed construction grading (see Sheet 5 of the Construction Plans) will involve excavation of approximately 34,100 cubic yards (cy) and fill of approximately 40,900. . The volume of imported soil for the low-permeability layer is estimated to be approximately 6,800 cy.

The low-permeability soil will be imported from Otay Annex Landfill stockpile or other Engineer-approved source if needed. Materials for the final closure cover, except low-permeability layer, may be obtained from the onsite borrow source identified on Sheets 4 and 5 of the Construction Plans.

8.6.3 Design and Construction of Final Cover System

Construction of the final cover system will be carried out in accordance with the Construction Plans, Technical Specifications for Final Closure (Exhibit B), QA/QC Program for Sesi Property Closure Construction (Exhibit C), and minimum requirements of Title 27. The QA/QC program conforms with Sections 20323 and 20324 of CCR Title 27. The goal of the QA/QC program is to assure construction conformance with the plans and specifications.

As described in Section 6.2, waste extends beyond the property limits in the eastern half of the Site. Therefore, a 4.5-foot deep, 12-foot wide key backfilled with final cover material will be provided along the property boundary. This key will satisfy final cover thicknesses required by regulatory agencies and provide a relatively level surface at existing grade onsite for construction of run-on/runoff control channels (see Sheet 9 of the Construction Plans).

Waste may be encountered during excavation for the final cover and in the area of the key. The excavated waste will be excavated and recompacted within the limits of the landfill area to achieve the final grades illustrated in Sheet 5 of the Construction Plans.

Excavations and waste removals will be performed under a health and safety plan that will be developed based on the conditions at the time of work. The proper permits will be obtained prior to any excavation of the waste.

Foundation Layer

At present, the Site is covered with an interim cover which is sparsely vegetated with bushes and shrubs. This vegetation will be removed and stockpiled onsite for later use as mulch for vegetative cover. Grubbing will not be performed in the area of final cover. Following removal of surface vegetation, the existing surface will be moisture conditioned and rolled with a single pass of a sheepsfoot roller prior to placing the proposed foundation material. Because all slopes are 3:1 (horizontal:vertical) or flatter, the final cover materials will be placed and compacted parallel to slope. The proposed foundation material will be placed in lifts not exceeding 8 inches in compacted thickness, moisture conditioned to 0 to 5 percent above the optimum moisture content, and compacted to at least 90 percent of the maximum dry density (ATSM D1557).

The area of the landfill covered with exposed waste and debris will be graded as necessary, in order to contain the debris at a minimum of 2 feet below the proposed foundation layer finished grade. Following limited grading, the waste fill surface will be covered with the proposed foundation material as described above.

Low Permeability Layer

The low-permeability material shall consist of fine grained soils containing no waste or leachate and shall have a significant clay content. The material shall be classified as CL, CH, or SC in accordance with the Unified Soil Classification System; shall have a maximum clod size of 1 inch; shall have at least 90 percent passing a No. 4 sieve; and a minimum 30 percent passing a No. 200 sieve. The material shall have a laboratory test permeability of 1.0×10^{-6} cm/sec or less after compaction.

The low-permeability layer soil will be hauled from stockpiles at the Otay Annex Landfill or other approved source and placed in 8-inch lifts in a temporary stockpile at the Sesi Property. Each soil lift shall be moisture conditioned to 3 and 6 percent above optimum and processed by a minimum of 2 passes of a Bomag MPH 100, CAT SS-250 soil stabilizer or equivalent. The soil shall be allowed to cure for a minimum of 48 hours prior to hauling to the placement area.

The low-permeability layer shall be placed on the graded and compacted foundation layer according to the Plans and Specifications. This layer shall be constructed with a minimum finished thickness of 1 foot and compacted to a minimum of 90 percent relative compaction as determined by ASTM D1557. The cover material shall be placed and compacted in two lifts of equal thickness to achieve uniform compaction. The moisture content of the material shall be carefully controlled such that during compaction, it is between 3 and 6 percent above the optimum moisture content, but not too wet to achieve the required degree of compaction. Based on the results of the laboratory tests (Section 6.5), the compaction procedure specified above is expected to achieve a hydraulic conductivity of 1×10^{-6} cm/sec or less for the low permeability layer. The finished surface of the low permeability layer shall be properly covered and maintained to minimize desiccation cracking.

Vegetative Layer

As specified in Title 27, Section 21090(a) (3), the material for vegetative layer shall contain no waste or leachate. The recommended minimum thickness of this topsoil cover is 1½ feet so that the penetration of roots (of the proposed vegetation planted on the cover) to the low permeability layer will be minimized. For the area of the major 3:1 front slope, the design includes 2 feet of vegetative soil cover to provide additional protection against erosional rilling in that area. Proper grading and compaction, as specified in the Plans and Specifications, shall be performed to minimize ponding and erosion.

Select soil for use in the upper 6 inches of the vegetative layer will be obtained by stripping the topsoil from the borrow area. The vegetative layer shall be placed in a minimum of three lifts, with the lifts not exceeding a compacted thickness of 6 inches. The lower two lifts shall be compacted to a minimum of 90 percent relative compaction (ASTM D1557). The upper 6 inches shall have a minimum relative compaction of 85 percent. Upon completion, the vegetative cover shall be seeded with drought tolerant vegetation. The surface of the topsoil shall be mulched to minimize seeding loss. Proper vegetative growth and maintenance are essential to minimize erosion of the topsoil layer and to maintain the integrity of the low permeability layer. Proper maintenance, as discussed in Section 16, shall include regular care of the vegetative cover, controlled access to the property, and regular inspection of the final cover.

Environmental Monitoring Systems

None of the environmental monitoring systems currently in operation at the Site, except Monitoring Wells WS3, WS5, and two lysimeters (Sheet 3), will be demolished, decommissioned or removed prior to or during closure, unless required by field conditions encountered during closure. The two monitoring wells and two lysimeters (which are located in or near the waste) will be decommissioned during closure in compliance with requirements of DEH and Section 21137 of Title 27. Description of the decommissioning procedure is presented in Section 14.2. Construction contractors will protect the other eleven (11) environmental monitoring wells and complete them to final grades. During abandonment or modification of wells or lysimeters, quality control observations and testing will be performed under the direction the Engineer or Engineering Geologist.

8.7 Recommended Field Hydraulic Conductivity (Permeability) Tests

Title 27 requires that an appropriate number of field permeability tests be performed to demonstrate that the low permeability layer meets the hydraulic conductivity requirements of 1.0×10^{-6} cm/sec or less. A field permeability test by the double-ring infiltrometer test (ASTM D3385) was previously completed (Corroll, 1994) for the Otay Annex Landfill stockpile soil. The regulations allow for monitoring permeability in the field during construction by conducting index property tests and then using correlations between index property tests and permeability (field and laboratory). These correlations will be established for Site-specific soils and the index property tests will be performed in conjunction with laboratory permeability and previously conducted field permeability tests. Permeability tests will be conducted using water as a permeant.

Prior to construction of the low permeability layer, a test pad will be constructed and a test program including collecting samples for laboratory index and permeability testing will be performed. The purpose of the test pad is to confirm suitability of the clay source for final cover, establish permeability correlations, and evaluate equipment and construction procedures proposed by the Contractor for construction of the low permeability layer.

Samples will be collected from the test pad for laboratory tests of hydraulic conductivity, grain size distribution, and Atterberg limits. These data will allow the correlation of field test parameters (field density and moisture content) with laboratory tests of index properties and hydraulic conductivity. Such correlations will allow monitoring of the quality of the cover placement using laboratory index property tests. Proposed field and laboratory tests, and test frequencies are give in Exhibit C - Quality Assurance and Quality Control Program for Sesi Property Closure Construction.

8.8 Site Revegetation

The goal of the revegetation planned for the Sesi Site closure project is to protect the final cover soils against erosion with minimal requirements for irrigation and maintenance, and to provide mitigation for disturbance of habitats on the project site related to the Removal Action. The planned engineered final cover and drainage facilities afford the opportunity to reestablish plant types that are native to the region and emulate the visual appearance of existing mesas and slopes in the immediate vicinity. Additionally, the use of native plants provides food and shelter for native fauna. Three planting schemes have been developed to meet these design goals.

1) Seeding with native grassland species;
2) Seeding with native coastal sage scrub species; and,
3) Salvage of native species and replanting the degraded riparian area at the toe of the landfill slope.

The limits of the proposed revegetation schemes are shown on Sheet 4 of the Construction Plans. Recommended seed mixes including plant name and application rates are provided in Table 8-3 - Seeding Mix. The seeding mix is subject to revision to comply with the final revegation plan as approved by the City of San Diego. Portions of the Sesi property will be protected by easement agreement with the City of San Diego to protect habitats on site from disturbance or development.

The top deck of the landfill, south and west-facing slopes, and other relatively flat areas within the limits of disturbance are planned to be seeded with native grassland species. North and east-facing slopes will be seeded with native coastal sage scrub species. In addition, the southerly portion of the landfill front slope, which is partially shaded by the south wall of Spring Canyon, will be seeded with coastal sage scrub. San Diego barrel cacti (*Ferrocactus virridescens*) were found within the Sesi property but outside the limits of grading for closure of the landfill; prior to clearing of the construction area, surveys for these plants will be performed and if any are found, the plants will be flagged and salvaged for later replanting during the site restoration activities.

Portions of the removal project abut and encroach into riparian habitats, including portions of Spring Canyon southwest of the toe of the landfill front slope. The area is presently heavily degraded by tamarisk (*Tamarix sp.*) trees. As a mitigation measure for this project, tamarisk within the limits of disturbance will be removed (including root systems) during clearing and grubbing activities. Existing native plants (Willow and Mexican Elderberry) will be salvaged for later replanting efforts. Upon completion of closure construction activities the riparian areas will be replanted with salvaged native plants from the site and additional nursery stock as needed.

Seeding and planting will be scheduled between October 15 and December 15, to allow naturalization with incident rainfall. Supplemental irrigation will be provided for container plantings during the first year of growth as needed. Close monitoring of plant establishment and weed abatement will be provided on a monthly basis for one year following revegetation, and on an as-needed basis for a total of five years. Maintenance and monitoring activities shall include weed eradication, maintenance of erosion control devices, maintenance of the irrigation system, trash removal and replacement of dead or diseased plant material as directed by the Project Biologist. These activities are designed to ensure the success of revegetation for both habitat mitigation purposes and water quality/erosion control purposes.

9.0 STABILITY OF FINAL SLOPE

9.1 General

Section 21145 of Title 27 addresses the stability requirements of the final exterior slope, and requires that final landfill slopes maintain integrity under both static and dynamic conditions, and slope stability analyses shall be performed and documented in a slope stability report. As part of ENV America's geotechnical evaluation for the project, an analysis of the conceptual design for the major 3:1 (horizontal:vertical) slope above Spring Canyon was performed. The detailed discussions of these evaluations are presented in our Geotechnical Report (ENV America, 1996a) and are summarized below.

9.2 Seismicity and Seismic Hazard Analysis

To estimate the ground accelerations induced at the Site for use in the geotechnical analyses of slope stability and liquefaction, a review of local and regional faults and seismicity was conducted. Historic earthquakes within 100-miles of the Site were compiled for magnitudes (M) between M4.0 and M8.0, as shown on Figure 2-5. The search identified 385 historic earthquakes, with the closest event located 20 miles to the northeast of the Site. The relative lack of seismicity in comparison to the broader Southern California region is consistent with the known geology and seismicity for the Site area.

To develop design accelerations, both deterministic and probabilistic evaluations were performed, considering the active and potentially active faults within 100 miles of the Site. The maximum Probable Earthquake (MPE) was defined as the maximum event with a 100-year return period. The deterministic evaluation provided the highest peak horizontal ground acceleration (PHGA) of 0.23g. Sustained repeatable high ground acceleration (RHGA) is about 0.66 of the PHGA, or 0.15g for the Site.

9.3 Slope Stability Analyses

As indicated on the Plans, the major waste slope is the 3:1 slope above Spring Canyon. The final grades for the waste fill slope were evaluated for stability due to the observation in borings and trenches of a saturated, soft clay layer within the alluvium underlying the waste fill. Three cross-sections through the slope were prepared and evaluated using computer methods. Strength parameters were selected based on extensive site-specific data, review of published literature, and engineering judgment. The analyses considered pre-closure water level conditions as represented by high levels recorded in March 1995, in the onsite wells completed within the waste fill. The March 1995 period was within a relatively wet winter/spring rainy season.

The analyses of the initial fill slope design indicated that the slope would be unstable as designed without some form of stabilization measures. Based on the Site conditions and slope geometry, a buttress fill solution was prepared that provided a satisfactory factor of safety (F.S.) that meets regulatory requirements. The buttress fill design consists of a central fill 55 feet wide at its base and 23 feet high (see Sheet 8 of the Construction Plans). The base of the fill would be keyed into bedrock, about 20 feet below existing grade in the canyon bottom at the toe of slope. The central portion of the buttress fill would be constructed with structural fill that is fill compacted to 95 percent relative compaction. The remaining fill would be engineered fill compacted to 90 percent relative compaction. To prevent excess pore pressures from developing in the slope, a buttress drainage system consisting of a gravel filled trench drain below the bottom of the key and a connected gravel drainage blanket will be placed against the upstream buttress excavation slope. This drainage system forms the Liquid Collection System for the Site.

Analyses of the proposed buttress fill indicated a F.S. for the most critical section and failure plane of 1.73. In addition, the slope deformation associated with the design RHGA was estimated using the Franklin and Chang (1977) method. A maximum seismic induced displacement of less than 4 inches for the slope was estimated for the design acceleration, which is acceptable within current engineering practice.

9.4 Liquefaction Analyses

Liquefaction, the loss of shear strength from shaking due to strong ground motion during an earthquake, was considered for the Site due to the observed high groundwater elevations. Liquefaction is typically most severe in silty sediments, such as the burn dump ash near the final slope above Spring Canyon. Using the general procedures developed by Seed and Idriss (1982), the potential for liquefaction of the burn dump ash was estimated. The calculated F.S. against liquefaction was greater than 2, indicating a low potential for liquefaction within the ash at the Site.

10. LANDFILL SETTLEMENT

10.1 Landfill Settlement Estimate

10.1.1 Contributing Factors

The major factors contributing to the settlement of a landfill include the nature and composition of the waste, initial waste density, content of decomposable materials in the waste, waste fill height, method of construction, initial moisture content, leachate level and fluctuation, and environmental factors such as precipitation and temperature (Oweis and Khera, 1990). Due to large variations of the above factors and extreme heterogeneity of composition of material, the settlements in one landfill could be spatially quite irregular and different from another landfill. Therefore, predictions of settlement in a landfill are quite difficult and the applied methods only serve as an indication of the order of magnitude of potential settlement.

10.1.2 Estimated Settlement at the Sesi Property

Post-closure, long-term settlement of the waste fill on the Sesi Property was estimated based on the thickness of waste, groundwater conditions, and the age and type of wastes. Waste and final cover thickness were estimated by comparing grades at closure and pre-landfill contours as shown on Figure 8-2 of the Geotechnical Report (ENV America, 1996a).

The maximum thickness of waste occurs close to the top of the proposed slope, in the vicinity of Monitoring Well MW-1, and waste is generally thickest in the deeper portions of the former canyon. Based on calculations presented in Exhibit J of the Geotechnical Report, settlement may be assumed to be 2 percent of the waste fill thickness. Accordingly, the maximum settlement would take place in this area, which would generally not impact the positive drainage of the final cover. Review of the final cover grading plan (Sheet 5 of the Construction Plans) indicates, however, the settlement may impact the slope of the final top deck between the culvert inlet in the southernmost area of the top deck and Monitoring Well MW-1. According to calculations presented in Exhibit J of the Geotechnical Report, the adverse slope caused by differential settlement between these locations is estimated at 0.5 percent and the minimum positive drainage in this area after settlement would be 2.5 percent. Differential settlements estimated for the portion of Channel A that crosses the refuse, range from 0.5 percent to less than 0.1 percent. The minimum positive drainage along the Channel after settlement would be 0.5%, and ponding of water over the Channel geomembrane lining would not occur.

10.2 Settlement Monitoring

The final closure construction will include establishment of two permanent monuments (benchmarks) outside the area of final cover that will be used for monitoring the settlement of the landfill as per the requirements of Section 20950 of Title 27, CCR. Proposed locations of the monuments are shown on Sheet 5 of the Construction Plans.

The closed landfill also will be periodically inspected and monitored for occurrence of localized differential settlements. Settlement monitoring following the closure may be carried out by surveying the landfill cover surface if substantial areas of depressions are identified during periodic inspections. Based on these monitoring and visual inspections, the landfill surface will be repaired as necessary to maintain surface drainage and the integrity of the low permeability layer, and to minimize infiltration into the waste.

11.1 General

This section presents the proposed final grading and drainage plans for the waste fill on the Sesi Property, and discusses the drainage features required to divert and convey surface runoff and offsite run-on.

The final grading plan was developed in accordance with the requirements of the final cover design discussed in Section 8.0. The drainage control plan was developed to address the major issues associated with the conveyance of the Spring Canyon run-on through the Site.

11.2 Final Grading Plan

The final grading plan for the Site was developed on a 40-scale (1-inch equals 40 feet) base map showing recent (October 1994) topography of the Site at 1-foot contours (Sheet 3 of the Construction Plans). The proposed grading is shown on Sheet 5 of the Construction Plans. The grading plan for the Site was developed in accordance with the site-specific criteria for design presented below.

Grading

- Excavation within the auto-shredder waste should be minimized as much as practicable. Grading for the burn dump ash need not be as constrained.
- Re-grading of front slope with relocation of ash and filling gullies is both technically feasible and environmentally practical.
- The minimum final cover design should conform to that outlined in Section 4.0 of this report. The minimum section to be accommodated is a 2-foot thick foundation layer, 1-foot thick low-permeability layer, and 1.5-foot thick vegetative layer.
- The finished landfill surface should be graded to minimum 3 percent slopes. Lesser slopes should be provided with an effective system to promote surface drainage from the covered wastes.
- Maximum side slopes should be 3:1 to satisfy Site specific geotechnical design evaluations and regulations. Exceptions include the side slopes of the channel at 2.5:1 which are of limited height (maximum 7 feet) in the area of final cover.
- The design should minimize the fill required to achieve foundation layer subgrade, while satisfying the minimum slope gradients.

- Wherever possible, uniform slopes over relatively large areas should be provided to simplify construction and survey control during grading.
- Design should accommodate continued service of existing monitoring wells that, in most instances, are in areas of waste and planned for final cover.
- All-weather access roads should be provided to the monitoring wells onsite.
- All-weather access to the pad for storage of pumped fluids from the liquid collection system should be provided.
- Final cover design should address covering of waste within and up to the property limits.

Drainage

- Drainage structure design should provide for a 100-year, 24-hour storm event.
- Run-on should be controlled at the limit of the final cover. Solutions include berms, perimeter channels, etc.
- Open, self-cleaning structures should be used wherever possible.
- An alignment should be developed for the main drainage channel that avoids Well MW-3.
- The length of Channel A should be limited over waste.
- Constraints to outlet conditions for the culvert under Cactus Road should be addressed.
- A cost-effective down drain for the main channel should be constructed in the area of the toe of the landfill.

11.3 Final Site Drainage

A summary of the runoff and flow estimates, and channel designs are provided below. More detailed discussions of the methods and computation procedures are provided in ENV America's Hydrology Report (1996c). The goal of these hydrology and hydraulic evaluations was to provide drainage designs that protect the integrity of the proposed closure improvements, in accordance with Title 27 CCR. These designs and evaluations will be reviewed by the City of San Diego to obtain a construction permit, and minor modifications may be required to satisfy local drainage policies.

11.3.1 Hydrologic Evaluation

Local hydrology was evaluated to establish the characteristics and quantity of runoff from the waste fill area and run on from offsite areas. The precipitation and drainage control system was designed in accordance with Sections 20365 and 21090 (b)(3), Title 27 CCR, which prescribes the 100-year, 24-hour design storm as the minimum event for design of closure of solid waste disposal sites.

Surface runoff in the immediate Site area drains to Spring Canyon, which is a tributary channel of the Tijuana River. The property receives run-on of surface-water from three principal areas, the area east of Cactus Road, the area north of the Site, and the area south of the Site. The area east of Cactus Road is largely undeveloped, agricultural property. Water drains beneath the road via a 48-inch diameter culvert constructed of reinforced concrete pipe (R.C.P.) which outlets within the Sesi Property. The property receives runoff from a commercial/industrial development north of the Site via another R.C.P. which outlets into a swale just north of the property boundary.

The surface water discharged onto the landfilled waste from offsite sources is estimated to be of significant quantities, as compared to direct onsite precipitation. Onsite surface-water runoff is generally directed southward to the Spring Canyon drainage.

To generate the surface water hydrology evaluation, various background data were required. These data included:

- Historical climatologic data;
- Surface topography;
- Soil type; and,
- Land use and land cover.

Historical climate data were obtained from the National Climatic Data Center and the California Department of Water Resources. Data included the first order summary of the day information for four stations: Miramar Naval Air Station, San Diego Lindbergh Field, Chula Vista Brown Field, and Lower Otay Dam. Data included, but was not necessarily limited to, minimum and maximum temperature, precipitation, average wind velocity, and minimum and maximum relative humidity.

Topography for the Site, including 1-foot elevation contours, was generated from aerial photography taken in October 1994. Offsite topography was taken from four San Diego County topographic maps, based on July 1960 aerial photography (Map Numbers 142-1767, 142-1773, 146-1767, and 146-1773). ENV America's Hydrology Report presents descriptions of two major offsite areas. Area I located north and east of the landfill is approximately 120 acres. Area II located north of the landfill is approximately 20 acres. The maximum elevation in Area I is approximately 507.5 ft ASL. The minimum elevation is approximately 490 ft ASL with an overall slope of approximately 34.3 feet/mile. The elevation change across Area II is approximately 16 feet with a slope of approximately 49.7 feet/mile. Area III to the south of the Site was included during the final closure plan design work. This area consists of 9 acres with an elevation change of 29 feet and a slope of about 83 feet/mile.

Three design storms were used to calculate peak runoff figures for both the pre-closure and post-closure scenarios for Areas I and II. The Corps of Engineers HEC-1 model was used to evaluate 100-year-24-hour, 25-year-24-hour, and 10-year-24-hour storms. Rainfall depth-duration-frequency data were generated from analysis of the Lower Otay Dam data. Lag times were generated using the San Diego County Hydrology Manual. Drainage Areas I and II were analyzed for both scenarios, generating 12 HEC-1 runs, which are included within the Hydrology Report. Additional analyses performed for the detailed design of Channel A and other onsite structures are included here in Exhibit D - Hydrology Evaluations.

11.3.2 Runoff Calculations

The HEC-1 model was used to calculate peak runoff for the pre- and post-closure scenarios. Because of the location of the landfilled waste at the head of the former Spring Canyon drainage, runoff generated in Area I and Area II must be controlled by the landfilled waste surface runoff management system. To be consistent with the CCR Title 27, the design will need to address runoff for a 100-year-24-hour storm event. Table 11-1 - Peak Runoff Summary, is a summary of the results of the surface runoff analyses.

11.3.3 Site Drainage Design

The preferred design approach for drainage channels over waste was to minimize lengths of surface water channels over waste wherever practical. Riprap, concrete, and gabion protection were selected to reduce velocity and erosion. This design approach would provide considerable savings over the cost of constructing entirely with hard linings and drop structures throughout the project, and enhances natural values in the area. Soil berms will be constructed at the edge of the top deck where surface runoff would flow down side slopes. The runoff will be collected and drained into an open channel by asphalt concrete lined down drains. Where closed depressions occur as the result of construction of the final cover such as the north side of the Sesi Property, drainage will be provided by HDPE culverts through or around the final cover section.

Riprap channel lining will be used in open channels with gradients less than 5 percent. Where the main channel crosses landfilled waste, a PVC liner will be constructed to minimize infiltration. Concrete lined channels will be limited to 170 lineal feet of the Channel A down drain. Gabions will be used to construct a stilling basin at the toe of the down drain in Spring Canyon.

Designs and standard drawings are based primarily on the California Department of Transportation (Caltrans) design manuals, standard plans, and recommendations.

Key Drainage Features

The key drainage features proposed as part of the drainage plan for the Site are described below and shown on Sheets 5 and 6 of the Construction Plans. Details of drainage features are provided on Sheet 10 of the Construction Plans.

Channel A. Channel A begins at the stilling basin in Spring Canyon and terminates at the 48-inch culvert under Cactus Road. The gabion and riprap stilling basin is designed to control run-up opposite the down drain and to effectively turn water at the natural grade of lower Spring Canyon. The down drain section will be concrete lined to minimize erosion in this steep (37 percent) section. Riprap lining will be used in the upper section of Channel A. A PVC lining will be placed below the riprap in sections of the channel constructed over waste.

Storm Drain Line A-1. To drain a limited area north of the Sesi Property, an 18-inch diameter HDPE culvert will be installed. The joints will be specified as water tight as the invert of the pipe will be below the final cover section over most of its length.

Channel A-2. This open channel will drain the substantial offsite run-on from areas north of the Site. The channel will be lined with riprap to minimize erosion.

Storm Drain Line B. Line B will consist of a 30-inch diameter HDPE culvert to convey offsite run-on from the south of the waste fill at the Sesi Property. An inlet will be provided to also drain runoff from the landfill top deck in the southwestern portion of the Site. The culvert will outlet into the stilling basin in the bottom of Spring Canyon.

12.0 GROUNDWATER MONITORING PROGRAM

The effectiveness of the cover and remedial action proposed at the Sesi Property site will be evaluated by implementing a periodic groundwater monitoring program using existing wells located on and near the Site. The program will provide information to satisfy both regulatory and the Court Coordinating Committee requirements. Because of the physiography of the Site and the nature of the proposed closure, a dynamic monitoring program is proposed to take into account variations from the expected behavior of the groundwater within the fill.

Since the groundwater underflow into the fill material is estimated to be minimal, installation of the cap and the liquid collection system at the buttress should effectively dewater the waste fill over a period of time. Therefore, the obvious measure of the effectiveness of the closure plan is to monitor the water elevations in the fill material and water production from the liquid collection system. Groundwater elevations will be monitored on a monthly basis for one year after construction of the cap and water control system. Wells that will be included in the water level monitoring network are shown on Figure 2-1, and listed in Table 12-1 - Proposed Groundwater Monitoring Program. In addition, during the first year the water elevation in the liquid collection system will be monitored on at least a monthly basis and on irregular intervals within each month. At the end of the one-year period, an evaluation will be made as to whether continued water elevation monitoring is required.

Water chemistry of the subsurface waters is not of as great of a concern since the liquid collection system should effectively collect all of the flow from within the fill material. Therefore, the water quality monitoring program is designed to sample the existing wells (1) immediately after construction, and (2) six months after construction is completed. After the two initial sampling events, an evaluation will be made as to the frequency and constituents that should be included in future sampling. The proposed sampling plan and frequency are outlined in Table 12-1. Based on analyses conducted for the closure plan, it appears that water levels in the wells will continue to drop and by the end of the second year, the water elevations will be below the bottom elevation of several of the well screens.

The chemistry of the water extracted from the liquid collection system will be evaluated initially within one week of placing the system in operation. After that time, the quality of the water in the liquid collection system will be monitored based on the waste discharge permit to be obtained for the Site.

13. POST-CLOSURE LAND USE AND SITE SECURITY

13.1 Post-Closure Land Use

The Final Closure and Post-Closure Maintenance Plans provide for closing and maintaining the waste fill area at the Sesi Property as a vegetated open-space area. The Site will be graded in harmony with the adjacent setting and landscaped with drought-resistant vegetation. The vegetation that was selected requires minimum irrigation and maintenance (see Section 8.8). Portions of the Sesi Property will be dedicated as an easement as part of the biological mitigation for this project, and would not be available for future impacts by development, and are intended to remain as open space.

13.2 Site Security

A 6-foot-high chain-link fence will be installed along the boundaries of the Site as shown in Sheet 5 of the Construction Plans. The entrance to the Site will be from Cactus Road through a pair of double gates. Appropriate signs will be placed on the fence.

14.0 SITE ENVIRONMENTAL CONTROLS AND EXISTING STRUCTURES

14.1 General

Existing environmental controls at the Site are of a limited nature. Existing structures include simple soil berms to control surface water at the Site and 12 groundwater monitoring wells (currently one well has been abandoned) and two lysimeters. Two wells and the two lysimeters will be abandoned as part of closure construction.

14.2 Decommissioning of Environmental Control Systems

Abandonment of wells WS5 and WS3 and the two lysimeters are planned as part of the closure construction. Monitoring Well WS5, located in Spring Canyon, has been abandoned (removed). Future sampling of groundwater in the area of WS5 will be accomplished through the liquid collected system planned as part of the buttress construction.

Monitoring Well WS3 and the two lysimeters will be abandoned by overdrilling the existing PVC casing and grouting the borehole to the ground surface. Abandonment of the wells will follow the guidelines in the California Department of Water Resources Bulletin 74-90. Permits for well abandonment will be obtained from the County of San Diego DEH, prior to the start of work.

In accordance with Section 21137 CCR Title 27, the solid materials obtained from the well and lysimeter abandonment activities will be disposed onsite under areas proposed for construction of the final cover.

14.3 Existing Structures

Eleven existing wells will be raised or lowered and completed to the new grades defined by the Construction Plans. For wells that require to be raised, additional casing will be provided to complete the wells flush with the ground surface. New locking well vaults, guard posts, well identification markers, and concrete pads will be constructed at each well, as shown on Sheet 11 of the Construction Plans.

15.0 PROJECTED CLOSURE SCHEDULE AND CLOSURE COST ESTIMATE

15.1 General

The final closure of the Sesi Property is scheduled to be conducted in 2005. An implementation schedule for closure construction is provided in Table 15-1 - Closure Construction Schedule. The schedule identifies major tasks involved in the closure and estimates a construction schedule of approximately 18 weeks.

The initial work of clearing of existing vegetation will be followed by the construction of the foundation layer. After a major portion of the foundation layer is constructed, placement of the low permeability layer will begin. Vegetative cover will be placed immediately upon acceptance of low permeability layer segments. Construction of drainage improvements may begin at an earlier stage if this does not interfere with construction of the final cover. Revegetation would occur in the fall and early winter season to take advantage of a more successful germinating season for native plans during that period.

15.2 Recording

In accordance with Section 21170 of Title 27, upon completion of closure activities at the Site, ENV America, acting as an agent for the U.S. District Court, will file a detailed description of the closed Site with the Recorder for San Diego County, the DEH, and the CIWMB.

15.3 Engineers Estimate for Closure Construction

A cost estimate for the closure activities described in this report was prepared and is itemized in Section 7.0. No escalation of the construction costs has been included. Actual costs may vary because of factors beyond the control of the estimator, including market factors, construction conditions, material availability, labor relations, and other unforeseeable future impacts.

The closure costs are heavily dependent upon the availability of the closure cover materials. It was assumed in this cost estimate that the low-permeability layer materials will be available from the Otay Annex Landfill site owned by Allied Waste Industries, Inc.

16.0 POST-CLOSURE MAINTENANCE PLAN AND ESTIMATED COST

16.1 General

After the closure construction of the Site has been completed, inspection, maintenance, and monitoring activities will be performed on a regular basis. These activities will continue for as is required by applicable regulations (Title 27). The post-closure activities are designed to maintain the long-term environmental control and monitoring systems and the integrity of the waste containment system. A description of these activities and the estimated cost of carrying out these activities over the post-closure maintenance period are provided in this section.

The following items will be inspected and maintained over the post-closure maintenance period by the operator of the landfill.

- Landfill cover integrity, such as cracking, subsidence, plant growth, rodent burrows, and erosion;
- Drainage system;
- Groundwater monitoring wells;
- Survey monuments;
- Site security, such as fencing, gates and signs.;

Detailed descriptions of the above items including a maintenance schedule are provided herein. The frequency of monitoring and maintenance activities is given in Table 16-1 - Schedule for Post-Closure Activities. Post-closure Site inspection checklist forms that list the items to be checked by the operator during post-closure inspections are presented in Exhibit E - Post-Closure Site Inspection Checklists.

16.2 Responsibility of Maintenance

More than 50 potentially responsible parties were identified in litigation that was filed on behalf of the owners of the Cactus Road property, referred to collectively as the Sesi Group (Case #91-1057-B(AJB), United State District Court, Southern District of California). These parties included arrangers, transporters, and owners of the facility during the time when it was actively used as a landfill. Settlement have been reached with all of the parties identified in this litigation, including *inter alia,* those parties to the Burn Ash Cross-Defendants Settlement Agreement referred to above. Primary among those settlements is the one reached with Signal Landmark Company, which was filed in the above referenced action on June 2, 1993. That agreement provided for the payment of money into a holding account to be used for remediation.

The use of the funds in the holding account is the subject to oversight, review, and approval by Magistrate Judge Battaglia, United State District Court, Southern District of California. That court-supervised fund is designed both to provide for the necessary money to install the engineered cap as proposed in this RAW, and to provide capacity for some ongoing inspection, maintenance, and groundwater monitoring.

The Sesi Group, who are the owners of the Site, include:

Mr. and Mrs. Salim Sesi 1415 Coker Way El Cajon, California 92921	Mr. and Mrs. Asmar D. Asmar 1935 Townsend Place El Cajon, California 92019
Mr. and Mrs. Najib Sesi 1248 Vista Del Monte Drive El Cajon, California 92020	Jenny and Kamal Alsawaf 1950 Townsend Place El Cajon, California 92019
Mr. And Mrs. Jay Zybelman 950 Muirlands Dr. La Jolla, California 92037	Mr. and Mrs. Wadie P. Deddeh 2534 Bartel Street San Diego, California 92123
Mr. and Mrs. Kyriakos T. Attisha 543 Deerhaven El Cajon, California 92019	Mr. J. Hannaney 1040 E. Washington, #34 El Cajon, California 92020

The offices of ENV America Incorporated act in an advisory capacity.

16.3 Cover Maintenance

This activity includes periodic visual inspection of the cover system by a qualified engineer or geologist for cracks, eroded areas, localized depressions, and damage from burrowing rodents. Maintenance consists of filling and compacting cracks and eroded areas with foundation, low permeability, or vegetative cover material according to the specifications of the original cover system. Slope areas may experience erosion due to runoff after a major storm. These slopes should be inspected after major storms and the necessary repairs should be implemented.

Localized depressions should be repaired by removing the vegetative cover and filling the depressed areas of the low permeability layer with clay material placed in layers (not more than 6 inches in loose thickness) and compacted to a minimum of 90 percent relative compaction according to ASTM D1557. The exposed areas of the low permeability layer should be scarified to a maximum depth of 2 inches prior to placing additional low-permeability material. The repaired low-permeability layer should be graded to drain and the vegetative cover restored. Plant cover disturbed by repair efforts should be reestablished in accordance with the planting schemes presented on Sheet 4 of the Construction Drawings.

Soil loss potential from surface water erosion was evaluated using the U.S. Department of Agriculture Universal Soil Loss Equation (USLE). The USLE was intended for analyses of cropland soil loss, but can be applied to landfill cover with certain assumptions. Over the post-closure maintenance period, the average annual cover soil loss due to the effect of surface water erosion over the Site is estimated at less than 0.19 ton/ac-yr on side slopes, and 0.01 ton/ac-yr on the top deck. This is a conservative estimate of the cover erosion, calculated assuming a low stand of vegetation and a soil type with high erodibility. Details of the cover soil erosion calculation are included in Exhibit F - Soil Erosion Calculation. In general, the landfill cover may not erode uniformly over the entire area but will loose material through formation of erosion gullies and erosion of isolated spots. The remaining vegetative layer will still be within the minimum thickness required by CCR Title 27. Restoration maintenance will be performed to repair areas of the final cover and surface drainage facilities following occurrence of major storm and significant soil erosion.

The permanent survey monuments installed at the Site will be protected to prevent disturbance or damage throughout the post-closure maintenance period. If these monuments become damaged or disturbed due to maintenance activity, they will be repaired or replaced and resurveyed.

In addition to the installation and survey of permanent monuments, a topographic survey will be conducted at the conclusion of closure activities and every five years after closure. Topographic maps of the top deck with a maximum contour interval of 2 feet will be produced from the survey. An isopach map will be produced to show the change in elevation between each two successive surveys. This information will be used to monitor settlement and schedule repair to the final grade if warranted.

16.4 Vegetation

Areas of dead or dying vegetation will be visually identified. Slopes and eroded areas will also be monitored. The cause of the die-off will be determined and mitigated as much as practicable, and the areas of dead vegetation reseeded using appropriate planting schemes illustrated on Sheet 4 of the Construction Drawings.

16.5 Drainage System

This activity includes visual inspection of drain pipes and channel flowlines for debris, other obstructions, and breaks and identification of areas where bank vegetation is overgrown or other conditions are impairing the functioning of the drainage channel. Maintenance could include cleaning channels and pipes, regarding and shaping channel flowlines and slopes, reseeding slopes, or replacing damaged culverts.

16.6 Groundwater Monitoring Wells and Lysimeters

There will be 11 existing groundwater monitoring wells at the Site that will be maintained following closure construction. All 11 wells should be maintained in operational condition throughout the post-closure maintenance period. The wellheads should be inspected regularly and any damage should be repaired.

16.7 Site Security

The 6-foot-high chain-link fence along the boundaries and the double gates for vehicle access at the Site entrance will be inspected to maintain the Site security. The fence will be inspected for breaks, settlement damage, and loss in tension. The gates will be inspected to ensure adequate movement is provided and that locks are intact. Any necessary repairs or replacements will be made at the time of the semiannual inspections. The fence will be inspected annually.

16.8 Liquid Management

The two types of liquids are anticipated are: 1) surface runoff, and 2) subsurface liquid. All surface runoff (comprising mainly water that entered the Site from offsite) will be discharged directly to the canyon via channels and the impermeable engineered cap, and will not be in contact with the waste. The engineering design has incorporated measures for discharge of water without erosion.

The subsurface liquid will be extracted from the extraction trench and placed inside an aboveground tank. Four options will be considered.

- Direct discharge with minimum treatment under an NPDES permit;
- Treatment and discharge under an NPDES permit;
- Discharge into a sewer system for treatment at a POTW facility; and,
- Transported and discharged at licensed recycling facility.

Based on the quantity of liquid and concentration of chemicals observed after construction, one or more options may be implemented at the Site.

16.9 Estimated Post-Closure Maintenance Costs

The estimated post-closure operation and maintenance cost is provided in Section 7.7.1. The general assumptions and limitations used in estimating these costs were the same as those presented in Section 15.0. The operation and maintenance work activities are presented in Table 16-2 - Post-Closure Operation and Maintenance Activities. The responsible parties and funding for post-closure activities is discussed in Section 16.2

16.10 Post-Closure Emergency Response Plan

In accordance with the requirements of Title 27, Section 21130, an emergency response plan was prepared as part of the Post-Closure Maintenance Plan and is presented in Exhibit G - Post-Closure Emergency Response Plan. The Emergency Response Plan will provide for occurrences that may exceed the design conditions of the Site and endanger public health or the environment. The plan describes specific procedures to be followed in the event of such occurrences as earthquakes, fires, vandalism, floods, releases of water to the environment, or surface drainage.

17.1 Worker Health and Safety

For implementation of this RAW, ENV America prepared a Worker Health and Safety Plan (H&S Plan), presented in Exhibit H. The H&S Plan will be used during the construction activities at the Site including grading and installation of the final cover. During the grading activities, the onsite workers may come in contact with the ash and auto-shredder waste. Therefore, potential hazards considered for onsite workers may include exposure to vapors, dust, noise, fires, explosions, and physical hazards associated with construction work. These hazards are discussed in the H&S Plan. In addition, procedures to be employed to minimize the exposures are identified and discussed.

17.2 Community Health and Safety

During the construction activities, ash and auto-shredder wastes may be exposed. Therefore, the potential public health hazards considered include potential vapors, dust, noise, fires, explosions, and physical hazards. All precautions necessary to ensure the community health and safety are discussed in the Community Health and Safety Plan, presented in Exhibit I.

18.0 LIMITATIONS AND PROFESSIONAL CERTIFICATION

The conclusions and professional opinions presented in this report for the Cactus Road Landfill Site located in the Otay Mesa Area of San Diego were developed by ENV America Incorporated for the United States District Court, in accordance with generally accepted civil engineering principles and practices. This warranty is in lieu of all other warranties, either express or implied.

The data, conclusions, and recommendations contained herein should be considered to relate only to the specific project and location discussed herein. ENV America is not responsible for any conclusions or recommendations that may be made by others, unless we have been given an opportunity to review such conclusions or recommendations and concur in writing. Implementing recommendations and compliance actions contained within this closure plan are not within the scope authorized in preparing this report and accompanying figures.

This report was prepared for the United States District Court, and for the benefit of Mr. and Mrs. Salim D. Sesi and Signal Landmark, for submittal to the California Integrated Waste Management Board, California Regional Water Quality Control Board, San Diego County Air Pollution Control District, and County of San Diego Department of Environmental Health. It may not contain sufficient information for the purposes of other parties or other uses. If any changes are made in the project as outlined in this report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report are modified or approved in writing by ENV America.

The following ENV America professional was responsible for all work associated with this project within the purview of the Professional Engineers' Act of the California Code of Regulations.

Maziar Reyhani, P.E.
President
Professional Engineer No. C056046

19.0 REFERENCES

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TABLES

TABLE 1-1

WASTE QUANTITY ESTIMATES - SESI PROPERTY
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA

ENV America Project No. MCU-01-T001

Data Source	Burn Dump Ash (cubic yards)	Auto Shredder Waste (cubic yards)
Environmental Analysis and Evaluation, Inc. (EAV, 1991)	38,450	40,000
Petra Geotechnical South (Jensen, 1992)	26,000	77,000
Ninyo & Moore (1995)	56,000	35,000

TABLE 2-1

WATER SUPPLY WELLS IN THE VICINITY OF THE SESI PROPERTY

State Well No.	Approximate Distance and Direction From Site	Depth (ft)	Data Available (Log, Water Levels, Chemistry)
18S/01W-26J1	3.2 miles, NE	806	L,WL,C
-26L1	1.8 miles, NE	1,030	L,WL,C
-26P1	1.9 miles, NE	758	L,WL,C
-26P2	1.8 miles, NE	Unknown	---
-29Q1	1.2 miles, NW	Unknown	---
-29Q2	1.2 miles, NW	Unknown	---
-29Q3	1.1 miles. NW	880	WL,C
-30L1	2.0 miles, NW	Unknown	---
-31G1	1.0 miles, W	Unknown	---
-32C1	1.2 miles, W	1,312	C
-32D1	1.2 miles, W	1,165	WL,C
-33K1	0.3 miles, SE	Unknown	---
-34F1	0.9 miles, E	1,374	C
-34N1	0.7 miles, SE	1,415	---
-35H1	1.5 miles, SE	930	L,WL,C
-35K1	2.3 miles, E	1,041	WL
-35M1	1.7 miles, E	Unknown	WL
-35Q1	2.0 miles, SE	Unknown	---
19S/01W-03D1S	1.0 miles, SE	1,340	WL,C
-03E1	1.2 miles, SE	Unknown	---

Note:
L = Geologic log
WL = Water level information
C = Chemistry analyses
Data Source: Department of Water Resources, Southern District. Compiled from well location base maps, well logs, and chemical analyses reports.

TABLE 2-2
SUMMARY OF GROUNDWATER ANALYSES
SESI PROPERTY CLOSURE PROJECT

COMPOUNDS	UNIT	WELLS COMPLETED IN AUTO SHREDDER WASTE & ASH												WELLS COMPLETED IN BEDROCK								WELLS COMPLETED IN ROAD FILL & NATIVE SOIL			
		WS1		WS2		MW-1		MW-3		MW-3D		MW-7		WS4		MW-2		MW-4		MW-6		MW-5		MW-8	
		12/15/1994	7/21/1995	12/9/1994	7/21/1995	12/9/1994	7/21/1995	12/15/1994	7/21/1995	12/15/1994	7/21/1995	12/9/1994	7/21/1995	12/15/1994	7/21/1995	12/9/1994	7/21/1995	12/15/1994	7/21/1995	12/9/1994	7/21/1995	12/15/1994	7/21/1995	12/15/1994	7/21/1995
VOCs (EPA 624/8240)																									
Aromatic																									
Benzene	ug/l	11	16	<2	<0.5	6.9	3.9	15	13	14	13	11	5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5
Ethylbenzene	ug/l	12	13	<2	<0.5	3.1	3.4	7.6	12	7.9	12	17	22	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5
Toluene	ug/l	<2	1.2	<2	<0.5	6.7	82	2.3	45	2	60	4.2	2.9	<2	76	<2	<0.5	<2	11	<2	120	<2	<0.5	<2	<0.5
Total Xylenes	ug/l	27	31	<2	<0.5	2.0	29	19	19	18	19	34	20	<2	1.4	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5
Halogenated																									
Tetrachloroethene	ug/l	<2	<0.5	16	<0.5	3.4	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	<2	<0.5	12	<0.5	<2	<0.5	<2	<0.5
Others	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEMI-VOCs (EPA 8270/625)																									
2,4-Dimethylphenol	ug/l	440,000	<5	<5	<5	<5	<5	200,000	240	160,000	130	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bis(2-ethylhexyl)phthalate	ug/l	<50	<5	<5	<5	<5	<5	<13	59	<5	34	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	110
Others	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH (EPA 150.1/9045)	-	6.8	6.8	6.8	7.0	7.3	7.3	7.1	7.0	7.1	6.9	7.3	7.4	6.5	6.4	6.3	6.4	7.2	6.9	6.5	6.6	6.8	6.7	7.1	7.2
METALS (EPA 6000/7000)																									
Arsenic (EPA 7060)	mg/l	0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01	0.01	0.02	0.03	0.03	0.67	0.02	0.047	<0.01	0.018	0.18	0.01	<0.01	0.03	<0.01	0.01
Barium (EPA 6010)	mg/l	2.5	2.5	0.1	0.43	0.3	0.4	1.1	1.7	1.3	1.9	0.96	0.7	0.28	0.24	0.3	0.31	0.06	0.066	<0.01	0.18	0.05	0.12	<0.01	0.06
Total Chromium (EPA 6010)	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper (EPA 6010)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (EPA 7421)	mg/l	0.11	0.55	<0.01	0.04	0.084	0.1	0.06	0.06	0.1	0.05	0.44	0.49	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.02	<0.01	<0.01	<0.01	<0.01	0.04
Nickel (EPA 6010)	mg/l	0.15	0.16	<0.05	<0.05	0.14	0.1	0.16	0.11	0.14	0.15	0.44	0.31	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc (EPA 6010)	mg/l	1.3	1.5	<0.01	0.09	0.067	0.12	0.44	0.46	0.5	0.47	0.5	0.55	0.02	<0.01	0.09	0.03	0.22	0.06	0.15	0.09	<0.01	<0.01	<0.01	0.05
Others (EPA 6010, 7060, 7196, 7421, 7471and 7841)	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MAJOR CATIONS & ANIONS																									
Sodium (EPA 6010)	mg/l	-	-	-	-	-	780	-	-	-	-	-	1,300	-	-	-	580	-	740	-	1,100	-	280	-	-
Potassium (EPA 6010)	mg/l	-	-	-	-	-	36	-	-	-	-	-	53	-	-	-	5.3	-	2.8	-	5.7	-	1.9	-	-
Calcium (EPA 6010)	mg/l	-	-	-	-	-	59	-	-	-	-	-	61	-	-	-	180	-	45	-	180	-	54	-	-
Magnesium (EPA 6010)	mg/l	-	-	-	-	-	23	-	-	-	-	-	73	-	-	-	93	-	64	-	120	-	46	-	-
Sulfate ((EPA 375.4)	mg/l	-	-	-	-	-	71	-	-	-	-	-	53	-	-	-	57	-	180	-	250	-	13	-	-
Bicarbonate (EPA 310.1)	mg/l	-	-	-	-	-	2,400	-	-	-	-	-	2,300	-	-	-	970	-	620	-	980	-	800	-	-
Chloride	mg/l	-	-	-	-	-	200	-	-	-	-	-	1,000	-	-	-	750	-	700	-	1,800	-	230	-	-
OTHERS																									
COD (EPA 410.2)	mg/l	-	-	-	-	-	260	-	-	-	-	-	560	-	-	-	130	-	<20	-	110	-	53	-	-
TDS (EPA 160.1)	mg/l	-	-	-	-	-	2,500	-	-	-	-	-	4,100	-	-	-	2,300	-	2,100	-	4,200	-	1,100	-	-
TSS (EPA 160.2)	mg/l	-	-	-	-	-	46	-	-	-	-	-	110	-	-	-	42	-	16	-	56	-	74	-	-

ENV America

Table 5-1
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
POTENTIAL CHEMICAL-SPECIFIC ARARs			
Clean Air Act (CAA) a. National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR 50-80	The CAA regulates air emissions of substances that may harm public health. Air pollutants that may be of concern at the site during remedial activities are listed below, along with primary NAAQS standards: • PM_{10} (particulate matter, diameter 10 micrometer [µm] or less)annual - 50 micrograms per cubic meters (µg/m^3) 24-hour - 150 µg/m^3 • Pb (lead) quarterly average - 1.5 µg/m^3 Cleanup of the site is not likely to result in classification as a "major source" under the CAA unless emissions equal or exceed 100 tons per year (tpy) of the pollutants for which the area is designated non-attainment. State implementation plans contain the specific regulations which govern the emission rates for such areas.	Potentially Applicable
b. National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC 7401 *et seq.*	NESHAP is established on an industry- and process-specific basis and must provide "an ample margin of safety to protect public health." All major stationary and area sources that emit or have potential to emit 10 tpy of any single hazardous air pollutant (HAP), or a total of 25 tpy of a combination of HAPs must comply with emission standards for that industry and HAP. This site contains many COCs that are listed as HAPs, however, it is very unlikely that the releases from the site will reach the 10 or 25 tpy threshold.	Potentially Applicable
Water Quality Control Plan San Diego Basin, 1994	Chapter 4, Water Quality Objectives, Basin Plan	Defines the water quality objectives for taste and odor, bacteria, toxic substances, chemical constituents, and radioactivity. Any concentration limits, cleanup levels, and/or treatment levels established for the site must comply with these objectives.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
Hazardous Waste Control Act (HWCA), as administered by the Department of Toxic Substances Control (DTSC)	22 CCR 66260 *et seq.*	The HWCA mandates the control of hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.	Potentially Applicable
a. Criteria for Identifying Characteristics of Hazardous Wastes	22 CCR 66261.10 *et seq.*	Tests must be performed on chemicals to identify hazardous characteristics. If a chemical is either listed or tested and found hazardous, then remedial alternatives must comply with the hazardous waste management requirements.	Potentially Applicable
b. Categories of Hazardous Waste	22 CCR 66261.100 *et seq.*	In addition to listing the four RCRA hazardous waste characteristics (reactivity, corrosivity, ignitability, and the Toxicity Characteristics Leachate Procedure [TCLP]), the HWCA regulations have established two other criteria: Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) for classifying hazardous waste. Bioassays assessing mammalian and aquatic toxicity of wastes are also used to determine whether a waste is hazardous under the HWCA. If a chemical is either listed or tested and found hazardous, then remedial alternatives must comply with the hazardous waste management requirements.	Potentially Applicable
Porter-Cologne Water Quality Control Act, as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (Water Board) - San Diego Region	27 CCR 20005 *et seq.* and California Water Code § 13000	This Act mandates regulations pertaining to land disposal unit design and construction standards that minimize dangers to the waters of the State. Wastes are classified as hazardous, designated, non-hazardous, or inert, and are disposed of accordingly. Regulations regarding water quality protection standards are determined by the Water Board on a case-by-case basis. Defines legislative intent to attain the highest water quality reasonable considering the demands on the resource. Provides the basis for selecting background as the cleanup goal. Applies to all ground water and soil remediation projects where ground water protection is an issue.	Potentially Applicable Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
a. SWRCB Resolution 88-63	SWRCB Res. 88-63	This resolution addresses site-specific conditions that should be considered in determining appropriate beneficial uses for ground water beneath the site. Ground water with solids concentrations exceeding 3,000 milligrams per liter (mg/l) and/or sustained yield less than 200 gallons per day should not be considered as a source of drinking water.	Potentially Applicable
b. SWRCB Resolution 68-16	SWRCB Res. 68-16	This resolution requires maintenance of existing water quality unless it is demonstrated that a change will benefit the people of the State, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed by other state policies. Further, the resolution requires that any activity that discharges waste to high quality water be required to meet waste discharge requirements. This policy is applicable to identifying appropriate ground water quality criteria for ground water beneath the site.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
POTENTIAL LOCATION-SPECIFIC ARARs			
City of Huntington Beach Soil Clean-up Standard	City Specification 431-92	The City has established risk-based hydrocarbon clean-up goals for residential and commercial/industrial developments and methodologies for sampling, remediation, and reporting of sites with petroleum hydrocarbon problems. The residential goals are <500 ppm total petroleum hydrocarbons (TPH) and <1,000 ppm TPH for commercial and industrial properties. Additional clean-up goals have been established for aromatic and polynuclear aromatic hydrocarbons.	Potentially Relevant and Appropriate
Orange County Heath Care Agency - Public Health Division of Environmental Health	Orange County Code Article 2, Section 4-5-17; Orange County Solid Waste Local Enforcement Agency (LEA)	The Orange County code contains standards and requirements for ground water wells in order to protect ground water quality in the basin. A permit must be obtained from the County prior to the construction or abandonment of any well. The County also serves as the LEA, as authorized by the Waste Board, overseeing the construction, operation, and closure for all landfills in the County. The LEA requires that a written work plan be submitted, reviewed, and approved prior to initiating any field work. Landfill closures must follow California requirements for Clean Closure.	Potentially Relevant and Appropriate
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 *et seq.* 40 CFR 240-271	RCRA establishes standards for the generation, management, and disposal of solid and hazardous waste. RCRA has limited application as an ARAR for alternative remedial actions at the site. Original waste disposal at the site generally ceased prior to RCRA regulations becoming effective in 1980. However, solid wastes associated with petroleum refining are not exempt as RCRA hazardous waste and therefore activities on the site could potentially generate as hazardous waste. In addition, certain remedial actions may include generation and disposal of solid or hazardous waste subject to RCRA requirements.	Potentially Applicable
Clean Water Act (CWA)	33 USC 1251 *et seq.* 40 CFR 100-140, 400-470	The CWA regulates the discharge of nontoxic and toxic pollutants into surface water by specific and non-specific sources. The CWA also specifies water quality criteria, requirements for state water quality standards based on these criteria, and wetlands regulations.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
Endangered Species Act	16 USC 1531 *et seq.* 40 CFR 6.302 50 CFR 17, 200, 402	The Endangered Species Act protects listed species and their habitat in the area of the proposed remedial action. To the extent such species are present at the site, this requirement is potentially applicable	Potentially Applicable
Fish and Wildlife Coordination Act	16 USC 661 *et seq.* 33 CFR 320-330	This Act requires federal and state agencies to ensure that actions do not jeopardize the existence of wildlife and their habitat. Where any action by a federal or state agency impounds, diverts, or controls water bodies or streams, that agency must first consult with the U.S. Fish and Wildlife Service, the Department of the Interior, and the California Department of Fish and Game. To the extent such wildlife and habitat are present at the site, this requirement is potentially applicable.	Potentially Applicable
Coastal Zone Management Act	16 USC 1451 *et seq.*	This Act requires federal agencies conducting or supporting activities directly affecting the coastal zone to ensure that such activities are consistent with the state program. "Coastal zone" is defined as the "coastal waters ... and the adjacent shore lands (including the waters therein and thereunder) strongly influenced by each other and in proximity to the shorelines of several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends inland from the shorelines only to the extent necessary to control shore lands, the uses of which have a direct and significant impact on the coastal water."	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
POTENTIAL ACTION-SPECIFIC ARARs			
National Pollution Discharge Elimination System (NPDES) under the CWA	33 USC 1342 40 CFR 122-125	The CWA regulates the discharge of nontoxic and toxic pollutants into surface water by specific and non-specific sources. In order to meet this requirement, an NPDES permit meeting discharge requirements must be obtained. The general requirements of a permit include (1) development and implementation of a Storm Water Pollution and Prevention Plan; (2) elimination of non-storm water discharge to storm water conveyances; and (3) monitoring of the quality and quantity of storm water discharges. Certain remedial alternatives proposed for the site could potentially trigger storm water discharge, therefore, these requirements are potentially applicable.	Potentially Applicable
Water Quality Control Plan, San Diego Basin, 1994	Chapter 3, Beneficial Uses	Defines beneficial uses for ground water beneath the site (San Ysidro Hydrologic Sub-Area) as: municipal, agricultural, and industrial supply. Because ground water beneath the site is a potential drinking water source, selection of concentration, cleanup and treatment levels should be made accordingly. The Basin Plan does not recognize the fact that ground water quality beneath the facility has been compromised by salt water intrusion.	Potentially Applicable
Discharges of Waste to Land	CCR Title 27	Specifies water quality monitoring and response programs for waste management units. Requires establishing concentration limits, monitoring points, and points of compliance for ground water, surface water, and soil. The capping alternative would be subject to these regulations.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
HWCA	22 CCR 66260 *et seq.*	The HWCA mandates the control of hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.	Potentially Applicable
a. Standards for Generators of Hazardous Waste	22 CCR 66262.10 *et seq.*	This regulation is applicable to hazardous waste resulting from remedial actions that generate hazardous waste on-site.	Potentially Applicable
b. Closure and Post-closure Requirements	22 CCR 66264.110 *et seq.*	This regulation sets standards that minimize the need for further maintenance, and control, minimize, or eliminate post-closure escape of hazardous waste, leachate, contaminated rainfall, or waste decomposition products to the ground or surface water or the atmosphere. These standards are potentially relevant and appropriate to certain remedial actions to the extent that the closure and post-closure requirements relate to the design requirements for monitoring ground water, stabilizing sump material, and isolating the to prevent direct contact.	Potentially Relevant and Appropriate
c. Standards for Transporters of Hazardous Waste	22 CCR 66263.10 *et seq.*	This regulations stipulates that hazardous waste must be transported by a hauler registered by the state. To the extent that hazardous wastes are transported for the remedial actions, the requirements are potentially applicable.	Potentially Applicable
d. Hazardous Materials Release Response Plan and Inventory	H&S Code 25500 *et seq.* 19 CCR 2700 *et seq.*	Businesses that handle hazardous materials are required to establish a plan for emergency response to a release or threatened release of hazardous materials. This requirement is applicable to the site and the hazardous materials release response plan and inventory should be incorporated into the site Health and Safety Plan.	Potentially Applicable
Mulford-Carrell Air Resources Act as implemented by the South Coast Air Quality Management Districts (SDAPCD) and administered by the California Air Resources Board (CARB)	H&S Code 39000 *et seq.*	The CARB and local air pollution control districts develop control measures aimed at reducing emissions of identified pollutants. Although it sets no standards, this Act is potentially applicable.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
SDAPCD Rules and Regulations			
a. Permits			
(1) Permit to Construct	Rule 10	Remedial actions viewed as a "stationary source" by the SDAPCD will require a permit to construct prior to initiating the remedial action.	Potentially Applicable
(2) Permit to Operate	Rule 10	Remedial actions deemed a "stationary source" will require a permit to operate.	Potentially Applicable
b. Prohibitory Rules			
(1) Visible Emissions	Rule 50	This rule limits visible emission from any point source.	Potentially Applicable
(2) Nuisance	Rule 51	This rule prohibits the discharge of any material, including odorous compounds, that may cause injury, annoyance to the public, property, or business, or may endanger human health, comfort, peace, or safety.	Potentially Applicable
(3) Particulate Matter	Rule 52	This rule limits particulate emissions for given volumetric gas flow rates.	Potentially Applicable
(4) Circumvention	Rule 60	This rule prohibits the unauthorized reduction or concealment of an emission.	Potentially Applicable
(5) Sulfur Content of Gaseous, Liquid or Fossil Fuels	Rule 62	This rule limits sulfur compounds from combustion of gaseous fuels.	Potentially Applicable
(6) Fuel Burning Equipment - Oxides of Nitrogen	Rule 68	This rule limits the concentration of oxides of nitrogen from non-mobile fuel burning equipment.	Potentially Applicable
c. Source Specific Standards			
(1) Waste Disposal Sites	Rule 59	This rule restricts emissions of odors, toxic air contaminants and/or reactive organic compounds from landfills. Landfill gas control systems are required unless site is maintained to meet emission standards. Requires subsurface gas monitoring. Remedial actions requiring waste excavation must obtain approval of mitigation measures by the Air Pollution Control Officer of the SDAPCD.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant and Appropriate
d. New Source Review of Carcinogenic Air Contaminants	Rule 1401	This rule specifies limits for cancer risk and excess cancer cases from new stationary sources and modifications to existing stationary sources that emit carcinogenic air contaminants. This rule establishes allowable emission impacts for all such stationary sources requiring new permits. Best Available Control Technology for Toxics (T-BACT) will be required for any system where a lifetime maximum individual cancer risk of 10^{-6} or greater is estimated to occur.	Potentially Applicable
California Safe Drinking Water and Toxic Enforcement Act of 1986	H&S Code 25249.5 *et seq.* 22 CCR 12000 *et seq.*	This rule regulates discharges and exposures of chemicals known to the State of California to be carcinogenic or reproductive toxins. Warnings are required to be provided to individuals exposed to "significant risks."	Potentially Applicable
California Occupational Safe and Health Act (OSHA)	Labor Code Section 6300 *et seq.* 8 CCR 330 *et seq.*	This regulation establishes the requirements for worker safety. All employees working at a Superfund or hazardous waste facility must have adequate 40-hour OSHA training in hazardous materials management.	Potentially Applicable

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Name of To-Be-Considered Criterion	Citation	Description and Comments
State Water Resources Control Board (SWRCB) Resolution 92-49	SWRCB Res. 92-49	The SWRCB's Policies and Procedures for Investigation and Cleanup and Abatement under Section 13304 of the Water Code, Resolution 92-49, establishes those conditions under which a Water Board or a local agency supervising cleanup "may establish containment zones (areas of ground water where water quality objectives cannot be reasonably achieved). In such cases, the Regional Water Quality Control Board (Water Board) must require implementation of environmental mitigation measures to offset implementation measures to offset significant adverse impacts from leaving pollutants in the ground water." Furthermore, Resolution 92-49 requires that actions for cleanup and abatement "conform to the provisions of Resolution 68-16 of the SWRCB, and the Water Quality Control Plans of the SWRCB and the Water Boards, provided that under no circumstances shall these provisions be interpreted to require cleanup and abatement which achieves water quality conditions that are better than background conditions."
Hazardous Waste Control Act (HWCA), as administered by the Department of Toxic Substances Control (DTSC)	22 CCR 66260 *et seq.*	The HWCA mandates the control of hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.
a. General Facility Standards	22 CCR 66264.1 *et seq.*	Facilities located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of hazardous wastes by a 100-year flood. Because there are no permanent hazardous waste treatment, storage, or disposal facilities proposed in the alternative remedial actions, this requirement will be a to-be-considered criterion to the extent that release during flooding can be minimized. In addition, the DTSC has promulgated regulations permitting the use of a corrective action management unit (CAMU) to manage remediation waste at permitted facilities. CAMUs will be used to manage remediation wastes identified as hazardous, if necessary.
b. Use and Management of Containers	22 CCR 66264.170 *et seq.*	Tank systems must meet the appropriate design standards and provide for adequate containment and detection/monitoring of leaks, inspections, and proper closure procedures.
c. Requirements for Design and Operation of Landfills	22 CCR 66264.300 *et seq.*	General design requirements for constructing/closing a landfill are similar to requirements for construction/closing a surface impoundment. These closure and post-closure requirements may be a to-be-considered criterion to the extent that they provide protective guidance regarding placement of wastes at the site and minimization of release of COCs present in sump materials.

Reference: ENVIRON (1998)

Table 5-1 (Continued)
Summary of Potential ARARs
Sesi Site, Otay Mesa, California

Name of To-Be-Considered Criterion	Citation	Description and Comments
Air Toxic "Hot Spot" Act, as implemented by the South Coast Air Quality Management Districts and administered by the California Air Resources Board	H&S Code 44300 *et seq.* 17 CCR 93300 *et seq.*	This regulation requires operators of specified facilities to prepare and submit inventory emissions plans and reports. This may be a to-be-considered criterion dependent on air emissions data, and volume of emissions generated during remediation.

Reference: ENVIRON (1998)

TABLE 6-1

COMPARISON OF FINAL COVER ALTERNATIVES
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Alternatives Description (Alternatives Include Minimum 2-foot Thick Foundation Layer)	Estimated Cost per Unit Area of Landfill Cover ($/yd)	Advantages	Disadvantages
1. One-foot-thick low permeability layer consisting of imported clay from offsite borrow source, with 1½-foot-thick vegetative cover.	4.00 to 8.00	• Meets CCR Title 27 requirements. • Settlement of surface is relatively easy to repair.	• Agreement with offsite borrow area needs to be processed.
2. One foot thick low permeability layer consisting of onsite soil blended with 8 percent bentonite, with 1½-foot-thick vegetative cover.	12.00 to 16.00	• Meets CCR Title 27 requirements. • Settlement of surface is relatively easy to repair.	• Quality control may be difficult. • If several soil types are used, bentonite-soil blends need to be redesigned.
3. Install textured 40 mil VLDPE membrane lined with bentonite (e.g., Gundseal™) with a composite drainage layer (consisting of 6 oz geotextile bonded to both sides of a geonet). One and a half-foot-thick vegetative cover is placed over VLDPE membrane.	14.00 to 16.25	• Exceeds CCR Title 27 permeability requirements. • Eliminates hauling of clay.	• Receipt of regulatory approval may affect schedule. • Potential damage to liner due to large deformations in the refuse. • Maintenance of surface grades after settlement may require local excavation of membrane lining, filling and lining repair. • Extensive QA/QC required.
4. Install geosynthetic clay liner (GCL) (e.g., Claymax™ sheets) with a composite drainage layer. One and a half-foot-thick vegetative cover is placed over the clay liner sheets.	13.50 to 14.00	• Exceeds CCR Title 27 permeability requirements. • Eliminates hauling of clay.	• Receipt of regulatory approval may affect schedule. • Potential damage to liner due to settlement. • Maintenance of surface grades after settlement may require local excavation of GCL filling and GCL repair.

TABLE 8-1

FINAL COVER MATERIAL REQUIREMENTS
SESI PROPERTY CLOSURE PROJECT
OTAY MESA AREA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Component of Final Cover	CCR Title 27 Requirements				Subtitle D Requirements			
	Material	USCS Classification	Minimum Thickness (feet)	Permeability	Material	USCS Classification	Minimum Thickness (feet)	Permeability
Vegetative Cover	Soil, containing no waste or leachate	None	1	None	Earthen Material	None	½	None
Low-Permeability Layer	Soil with significant clay content[1] containing no waste or leachate	SC, CL (clayey sandy material) CH (clay, sandy clay)	1	Less than or equal to 10^{-6} cm/sec or equal to the permeability of any bottom liner system or underlying natural geologic materials	Earthen Material	None	1½	Less than or equal to the permeability of bottom liner or underlying natural subsoils or no greater than 10^{-5} cm/sec whichever is less
Foundation	Soil, contaminated soil, incinerator ash, or other waste material	None	2	None	6-inch thick daily cover consisting of earthen material will serve as the foundation layer	None	½	None

Notes:

[1]Significant clay content is defined as at least 30 percent of the material passing No. 200 U.S. Standard Sieve.

ENV AMERICA

QA/QC: _____
DATE: _____

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TABLE 8-2
OTAY ANNEX LANDFILL STOCKPILE CLAY TEST DATA
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Sample Number	Source	Percent Passing #200 Sieve	Percent Passing .005mm	Atterberg Limits			UCSC Classification	Maximum Dry Density	Optimum Moisture Content (%)	Remolded Sample Relative Density	Remolded Sample Moisture Content	Confining Pressure (psi)	Permeability (cm/sec)
				LL	PL	PI							
SF4-2	S.E. STOCKPILE	46		55	28	32	SC	115	13.2	90.2			5.50E-07
SF4-4	S.E. STOCKPILE	61		48	27	21	CL/ML	117.4	13.5	90			1.20E-06
SF4-5	S.E. STOCKPILE	60		52	25	29	CL	116.6	13	90			1.50E-06
SF4-7	S.E. STOCKPILE	46		52	26	36	SC	111	13	90.8			1.50E-08
SF4-7[a]	S.E. STOCKPILE	50		50	25	25	CL/CH/SC	111.5	17	90			1.6E-06[a]
SF4-7	S.E. STOCKPILE	50		50	25	25	CL/CH/SC	111.5	17	94.9			3.60E-08
SF4-7	S.E. STOCKPILE	50		50	25	25	CL/CH/SC	111.5	17	90.2			6.50E-08
P-1	TEST PAD	63		59	30	29	CH						7.50E-08
P-2	TEST PAD	67		58	26	32	CH						8.50E-08
P-3	TEST PAD	73		59	27	32	CH						1.40E-07
P-4	TEST PAD	69		61	28	33	CH						9.00E-06
OML	S.E. STOCKPILE			50	20	30		114	16	89.5	18	5	1.00E-07
OML	S.E. STOCKPILE			50	20	30		114	16	90	18	10	8.00E-08
OML	S.E. STOCKPILE			50	20	30		114	16	90	18	20	3.10E-08

ENV AMERICA

QA/QC: _____

DATE: _____

TABLE 8-2 (Continued)
OTAY ANNEX LANDFILL STOCKPILE CLAY TEST DATA
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Sample Number	Source	Percent Passing #200 Sieve	Percent Passing .005mm	Atterberg Limits			USCS Classification	Maximum Dry Density	Optimum Moisture Content (%)	Remolded Sample Relative Density	Remolded Sample Moisture Content	Confining Pressure (psi)	Permeability (cm/sec)
				LL	PL	PI							
BS-1A/1B	S.E. STOCKPILE	52	20	59	26	33	CH	116	16	89.8	18	5	2.70E-06
BS-1A/1B	S.E. STOCKPILE	52	20	59	26	33	CH	116	16	90.1	20	5	8.10E-08
BS-1A/1B	S.E. STOCKPILE	52	20	59	26	33	CH	116	16	90.1	22	5	2.10E-08
BS-1A/1B	S.E. STOCKPILE	52	20	59	26	33	CH	116	16	95	18	5	3.80E-08
BA-0-1.5	E. STOCKPILE	47	31				SC						
BA-2.5-3	E. STOCKPILE	28	14				SC						
BULK #1	E. STOCKPILE	62	28	39	18	21	CL						
BULK #2	E. STOCKPILE	32	23	41	17	24	SC						

Notes:
**Sample prepared by screening out clay clods before testing.

ENV AMERICA

QA/QC: _____
DATE: _____

TABLE 8-3

SEEDING MIX
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Scientific Name	Common Name	Approximate Pounds of Seed/Acre
Native Grassland Seed Mix		
Bloomeria crocea	Common Goldenstar	1.0
Bromus carinatus	California Brome	6.0
Dichelostemma capitatum	Blue Dicks	1.0
Encelia californica	California Encelia	2.0
Eschscholzia californica	California Poppy	3.0
Hordeum californicum	California Barley	5.0
Lotus scoparius	Deerweed	3.0
Lupinus bicolor	Miniature Lupine	3.0
Nassella cernua	Nodding Stipa	1.0
Nassella lepida	Foothill Needlegrass	1.0
Nassella pulchra	Purple Needlegrass	3.0
Poa secunda ssp. secunda	Bluegrass	3.0
Sisyrinchium bellum	Blue-Eyed Grass	1.0
Viguiera laciniata	San Diego Sun Flower	3.0
Vulpia microstacys	Zorro Grass	2.0
Sage Scrub Seed Mix		
Artemisia californica	California Sagebrush	2.0
Artemisia palmeri	Tall Sagebrush	2.0
Baccharis pilularis	Coyote Brush	0.5
Bromus carinatus	Brome Grass	2.0
Dichelostemma capitatum	Blue Dicks	0.5
Encelia californica	California Encelia	1.0
Ericameria palmeri	Palmers Goldenbush	0.5
Eriogonum fasciculatum	California Buckwheat	3.0
Eriophyllum confertiflorum	Golden Yarrow	1.0
Eschscholzia californica	California Poppy	1.0
Gnaphalium bicolor	Bicolored Everlasting	0.5

TABLE 8-3 (Continued)

SEEDING MIX
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Scientific Name	Common Name	Approximate Pounds of Seed/Acre
Sage Scrub Seed Mix (Continued)		
Gnaphalium californicum	California Everlasting	0.5
Helianthemun scoparium	California Rush Rose	1.0
Hordeum californicum	California Barley	1.0
Isocoma menziesii	Coast Goldenbush	2.0
Iva hayesiana	San Diego Poverty Weed	3.0
Lasthenia californica	Goldfields	1.0
Layia platyglossa	Tidy Tips	1.0
Leymus condensatus	Giant Wild Rye	1.0
Lotus scoparium	Deerweed	2.0
Lupinus bicolor	Miniature Lupine	2.0
Lupinus succulentus	Arroyo Lupine	2.0
Malocothamnus fasciculatius	Mesa Bushmallow	1.0
Melica imperfecta	Coast Range Melic	1.0
Muhlenbergia rigens	Deergrass	1.0
Nassella cernua	Nodding Stipa	1.0
Nassella lepida	Foothill Needlegrass	1.0
Nassella pulchra	Purple Needlegrass	3.0
Plantago insularis	Plantain	10.0
Salvia apiana	White Sage	2.0
Salvia mellifera	Black Sage	1.5

TABLE 11-1

PEAK RUNOFF SUMMARY
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Drainage Area	Storm Event	Peak Runoff (cfs)	
		Pre-Closure	Post-Closure
Area I	10 year - 24 hour	103	139
	25 year - 24 hour	155	195
	100 year - 24 hour	240	285
Area II	10 year - 24 hour	29	39
	25 year - 24 hour	43	54
	100 year - 24 hour	67	79
Area III[1]	100 year - 24 hour	24	24

Notes:
[1]Runoff based on rational method for Area III.
cfs = cubic feet per second
Based on these analyses, drainage management for the landfilled waste was designed to convey 285 cfs.

TABLE 12-1

PROPOSED GROUNDWATER MONITORING PROGRAM
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Well	Completion Zone	Water Level Monitoring	VOCs (USEPA 624)	Semi-VOCs (USEPA 625)	Metals (list)	Total Dissolved Solids
MW-1	Burn Dump Ash	Monthly	3	3	3	3
MW-2	Bedrock	Monthly	3	3	3	3
MW-3	Auto Shredder Waste	Monthly	3	3	3	3
MW-4	Bedrock	Monthly	3	3	3	3
MW-6	Bedrock	Monthly	3	3	3	3
MW-7	Auto Shredder Waste	Monthly	3	3	3	3
WS-2	Burn Dump Ash	Weekly - pre- and post-construction for (1 month before and after)	2	2	2	2
Infiltration Trench	Not Applicable	Monthly	1	1	1	1

Notes:
1 = Quarterly sampling and analysis.
2 = Pre- and post-construction sampling and analysis.
3 = Pre-construction, Post-construction and 6-month sampling and analysis.

TABLE 15-1

CLOSURE CONSTRUCTION SCHEDULE
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

Activity	Anticipated Start Date	Duration (work days)
Secure All Permits	April 2005	30
Prepare Construction Bid Package	May 2005	20
Obtain Bids from Contractors	June 2005	30
Award Construction Bid	July 2005	10
Construction of Closure Improvements	September 2005	90

TABLE 16-1

SCHEDULE FOR POST-CLOSURE ACTIVITIES
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA
ENV America Project No. MCU-01-T001

INSPECTION AND MAINTENANCE ITEMS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cover System Maintenance			O						O/X			O
Drainage and Other Structures			O						O/X			O
Liquid Collection and Disposal			O/X						O/X			O/X

Notes:
Inspection = O
Maintenance = X

ENV AMERICA

QA/QC:_____
DATE:_____
F:\ENVDOCS\MCU\REPORTS\RAW\RAW-TABLE-16-1.WPD

TABLE 16-2

POST-CLOSURE OPERATION AND MAINTENANCE ACTIVITIES
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO, CALIFORNIA

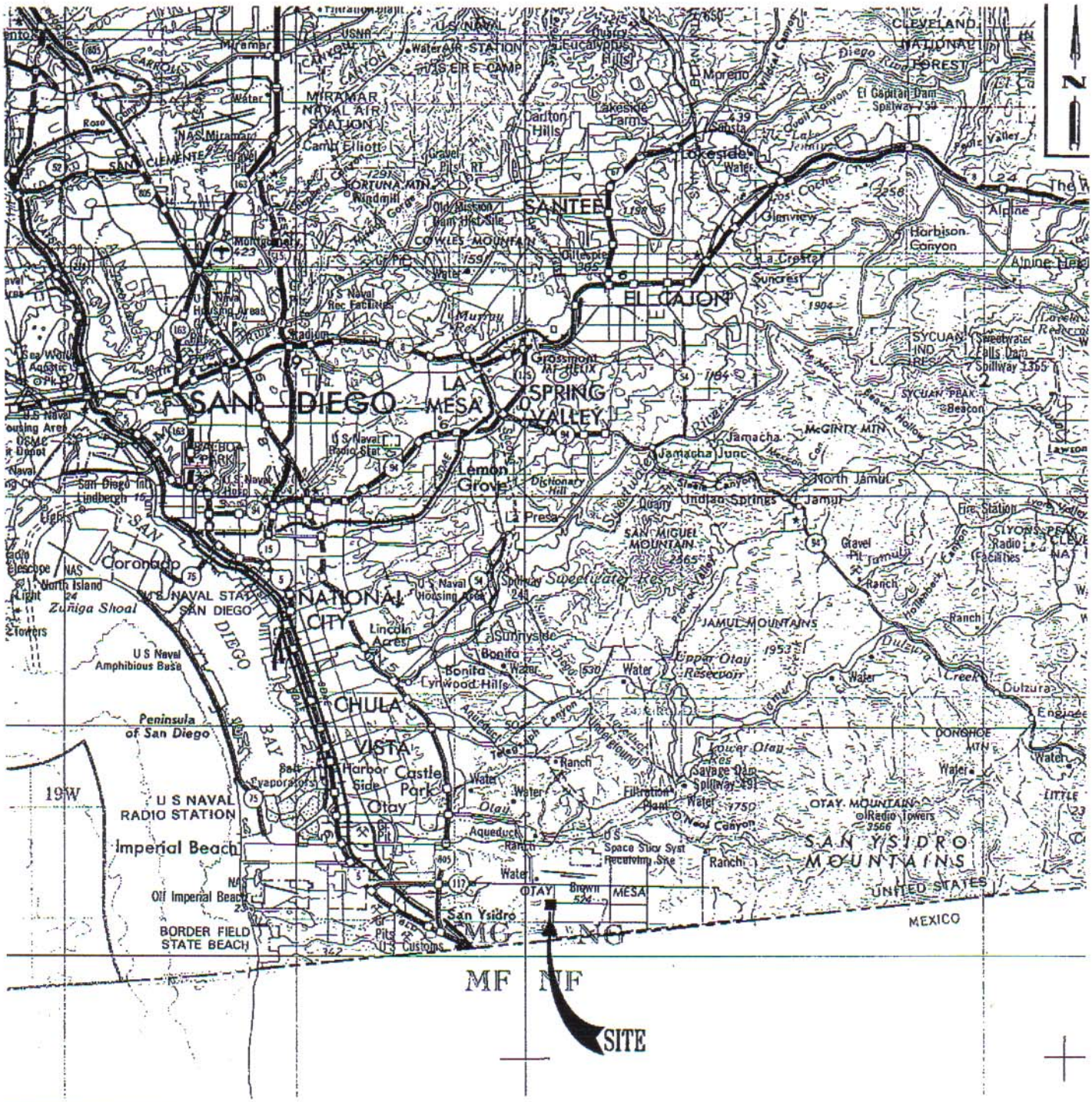
ENV America Project No. MCU-01-T001

ACTIVITY	ASSOCIATED WORK
Cover Maintenance	Annual grading, filling and reseeding of low areas and eroded areas. Work performed in late fall. • Labor, Materials
Drainage and Other Maintenance	Drainage • Repair and cleaning of drainage structures • Access Road and Security Fence Maintenance • Labor, Materials, Equipment
Groundwater Monitoring Wells, Monitoring and Maintenance	Monitoring quarterly and sample collection and testing on an annual basis by one engineering technician for the first five (5) years. • Labor, Materials, Equipment and Testing
Liquid Disposal	Operation and Maintenance • Pump and storage tank • Treatment and discharge or disposal at POTW
Maintenance Reporting, and Regulatory Compliance	Site Inspection • Site visit by engineering technician - 1 day/month • Engineering, Legal and Administrative

ENV AMERICA

QA/QC:_____
DATE:_____

FIGURES



REFERENCE:

1 BY 2 DEGREES SERIES U.S.G.S. TOPOGRAPHIC MAP OF SAN DIEGO, CALIFORNIA, DATED 1958, REVISED 1978.

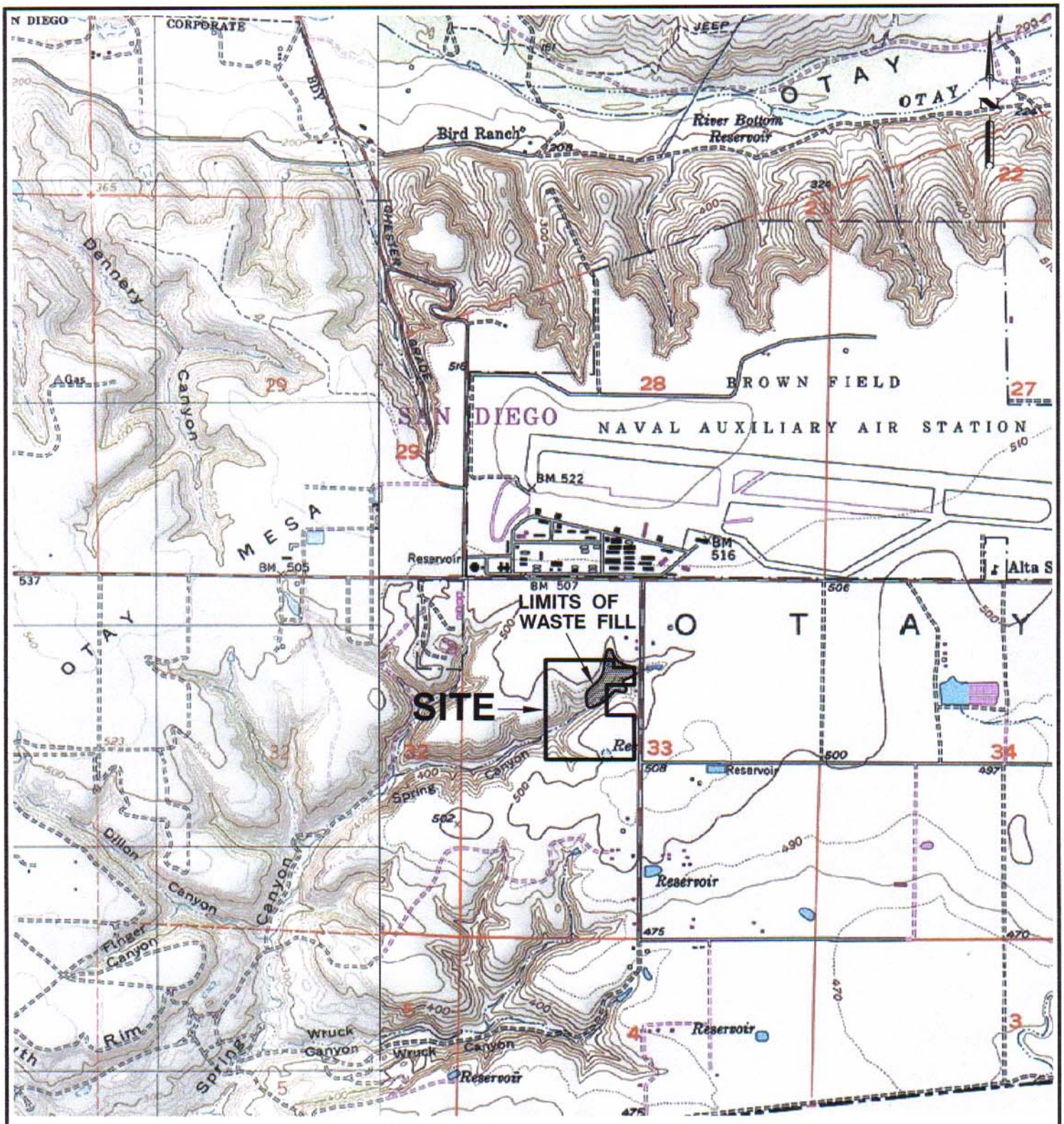
DRAWN BY	DP	CHECKED BY			FILE NAME	VICINITY MAP
	11/11/98	APPROVED BY			PROJECT NUMBER	MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 1-1

SITE VICINITY MAP

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



0 1000 FEET 0 500 1000 METERS

REFERENCE:

7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAPS OF:
– IMPERIAL BEACH, CALIFORNIA – BAJA CALIFORNIA NORTE, DATED 1967, PHOTOREVISED 1975.
– OTAY MESA, CALIFORNIA, DATED 1955, PHOTOREVISED 1971, PHOTO INSPECTED, 1975.
ORIGINAL SCALE ON BOTH MAPS: 1 INCH = 2,000 FEET.

DRAWN BY	DP	CHECKED BY			FILE NAME	LOCMAP
	11/11/98	APPROVED BY			PROJECT NUMBER	MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 1–2

SITE LOCATION MAP

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	DP			
	10/16/01			
	CHECKED BY	APPROVED BY		
FILE NAME	MCU\T01\RAW\SITE-P			
PROJECT NUMBER	MCU-01-T001			

BARNHART PROPERTY LINE

BARNHART PROPERTY

DANTZLER PROPERTY LINE

DANTZLER PROPERTY

SESI, ET AL, PROPERTY

PRIVATE PROPERTY

PRIVATE PROPERTY

N 88°30'17" W 910.44'

N 00°55'13" E 100.00'

N 88°23'25" W 414.02'

N 00°55'13" E 200.01'

N 88°23'25" W 414.02'

N 00°55'13" E 400.03'

CACTUS ROAD

N 1,786,200

N 1,786,000

N 1,785,800

N 1,785,600

N 1,785,400

E 6,334,800

E 6,334,600

E 6,334,400

E 6,334,200

E 6,334,000

UB

UB's

Sign

Post

Culvert

Asph

Conc

HH

FH

Poles

Post

LEGEND

- APPROXIMATE LIMIT OF WASTE PLACEMENT AT SESI PROPERTY
- ESTIMATED LIMITS OF FORMER CANYON
- PROPERTY LINE
- FENCE
- 460 — GROUND SURFACE CONTOUR IN FEET ABOVE MEAN SEA LEVEL DATED 1994
- N / E — STATE PLANE COORDINATE

REFERENCE:

TOPOGRAPHIC MAP PREPARED BY ZENITH AERIAL, INC., BASED ON AERAIL PHOTO DATED 10/12/94.

0 100 200 FEET

APPROXIMATE SCALE

ENV AMERICA

ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 1-3

SITE PLAN

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	DP
	10/16/01
CHECKED BY	
APPROVED BY	
FILE NAME	MCU\T01\PLANS\1960TOPO
PROJECT NUMBER	MCU-01-T001

BARNHART PROPERTY LINE

BARNHART PROPERTY

BARNHART PROPERTY

DANTZLER PROPERTY LINE

DANTZLER PROPERTY

SESI, ET AL, PROPERTY

PRIVATE PROPERTY

PRIVATE PROPERTY

CACTUS ROAD

MW1 MW2 MW3 MW4 MW5 MW6 MW7 MW8

WS1 WS2 WS3 WS4

500 475 450 425

EXPLANATION

- GROUNDWATER MONITORING WELLS
- APPROXIMATE LIMIT OF WASTE PLACEMENT AT SESI PROPERTY
- ESTIMATED LIMITS OF FORMER CANYON
- PROPERTY BOUNDARY
- 450 GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL

REFERENCE:
TOPOGRAPHIC MAP PREPARED BY INTERNATIONAL MAPPING CORPORATION BASED ON AERIAL PHOTOGRAPHY, 1960.

0 100 200 FEET
APPROXIMATE SCALE

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 1-4

PRE-LANDFILLING TOPOGRAPHY

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	DP			mcu\closure\geology
	10/16/01			MCU-01-T001
CHECKED BY	APPROVED BY			FILE NAME
				PROJECT NUMBER

LEGEND

BS4	SOIL BORING (APPLIED GEOSCIENCE)
B18	SOIL BORING (ENVIRON)
T-6	EXPLORATORY TRENCH (GEOCON)
T24	EXPLORATORY TRENCH (ENVIRON)
TS5	EXPLORATORY TRENCH (APPLIED GEOSCIENCE)
Aflc	ARTIFICIAL FILL, LANDFILL CELL
Af	ARTIFITIAL FILL – EXISTING SOIL COVER, RANDOM FILL
Afa	BURN DUMP ASH
Afs	AUTO SHREDDER WASTE
Qal	QUATERNARY ALLUVIUM
Qsw	QUATERNARY SLOPEWASH
Ql	QUATERNARY LINDAVISTA FORMATION
To	TERTIARY OTAY FORMATION (BEDROCK)
	GEOLOGIC CONTACT
	ESTIMATED LIMITS OF FORMER CANYON
16	STRIKE AND DIP OF BEDDING
86	STRIKE AND DIP OF JOINT
G G'	TRACE OF GEOLOGIC CROSS-SECTION
	APPROXIMATE TRACE OF ORIGINAL CANYON FLOW LINE
TP3	EXPLORATORY TRENCH (ENV AMERICA)
MW8	GROUNDWATER MONITORING WELL (ENV AMERICA)
WS5	GROUNDWATER MONITORING WELL (APPLIED GEOSCIENCE)
460	GROUND-SURFACE CONTOUR IN FEET ABOVE MEAN SEA LEVEL DATED OCTOBER, 1994

REFERENCE:

TOPOGRAPHIC MAP PREPARED BY ZENITH AERIAL, INC., BASED ON AERAIL PHOTO DATED 10/12/94.

0 100 200 FEET

APPROXIMATE SCALE

ENV AMERICA

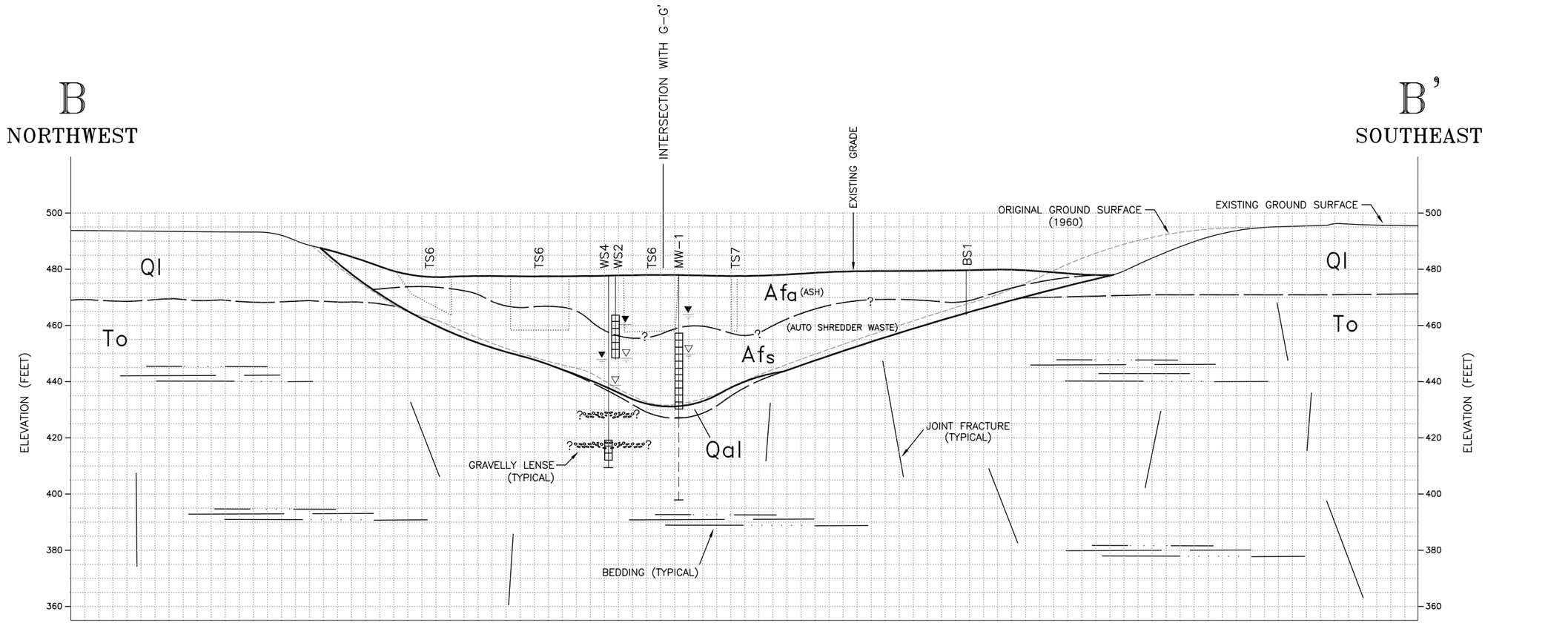
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2-1

GEOLOGIC SITE PLAN

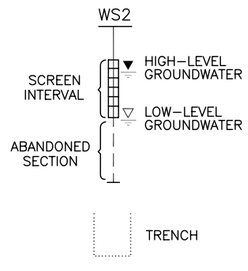
SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	SY	CHECKED BY		FILE NAME	MCU\CLOSURE\BB
	8/9/96	APPROVED BY		PROJECT NUMBER	MCU-01-T001



CROSS SECTION B–B'

EXPLANATION



Afa	ARTIFICIAL FILL– BURN DUMP ASH
Afs	ARTIFICIAL FILL– AUTO SHREDDER WASTE
Qal	QUATERNARY ALLUVIUM
Ql	QUATERNARY LINDAVISTA FORMATION
Qsw	QUATERNARY SLOPEWASH
To	TERTIARY OTAY FORMATION (BEDROCK)

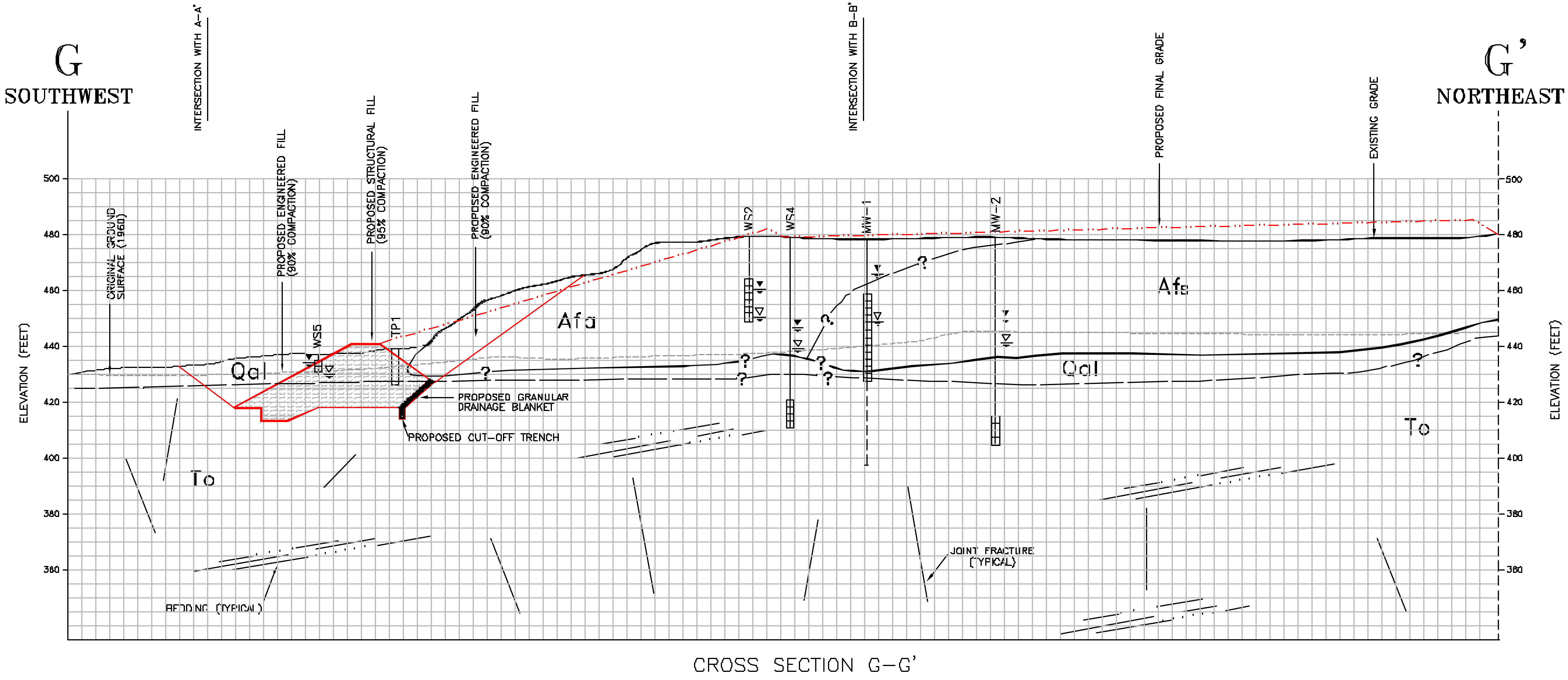
0 40 80 FEET
APPROXIMATE SCALE

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2–2

GEOLOGIC CROSS–SECTION B–B'

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



CROSS SECTION G–G'

EXPLANATION

WS2		Afa	ARTIFICIAL FILL– BURN DUMP ASH
SCREEN INTERVAL	HIGH–LEVEL GROUNDWATER	Afs	ARTIFICIAL FILL– AUTO SHREDDER WASTE
	LOW–LEVEL GROUNDWATER	Qal	QUATERNARY ALLUVIUM
ABANDONED SECTION		Ql	QUATERNARY LINDAVISTA FORMATION
		Qsw	QUATERNARY SLOPEWASH
	TRENCH	To	TERTIARY OTAY FORMATION (BEDROCK)

0 40 80 FEET
APPROXIMATE SCALE

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

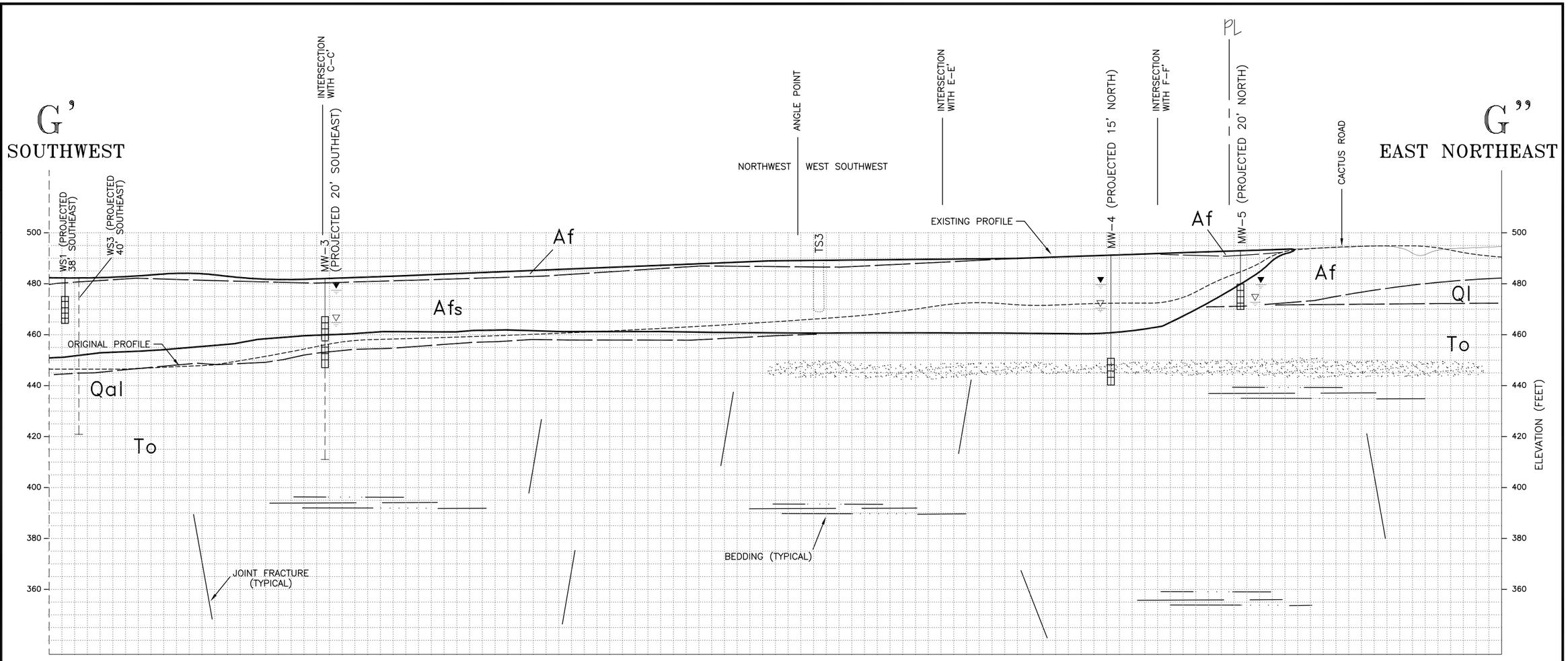
FIGURE 2–3

GEOLOGIC CROSS–SECTION G–G'

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

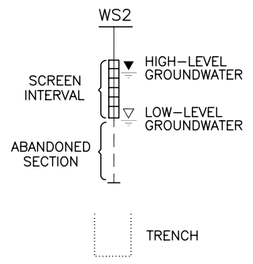
FILE NAME	MCU\CLOSURE\CC1
PROJECT NUMBER	MCU-01-T001
CHECKED BY	
APPROVED BY	
BY	SY
	8/8/86
DRAWN BY	

DRAWN BY	SY	CHECKED BY		FILE NAME	MCU\CLOSURE\G02
	8/9/96	APPROVED BY		PROJECT NUMBER	MCU-01-T001



CROSS SECTION G'–G''

EXPLANATION



Afa	ARTIFICIAL FILL– BURN DUMP ASH
Afs	ARTIFICIAL FILL– AUTO SHREDDER WASTE
Qal	QUATERNARY ALLUVIUM
Ql	QUATERNARY LINDAVISTA FORMATION
Qsw	QUATERNARY SLOPEWASH
To	TERTIARY OTAY FORMATION (BEDROCK)

0 40 80 FEET
APPROXIMATE SCALE

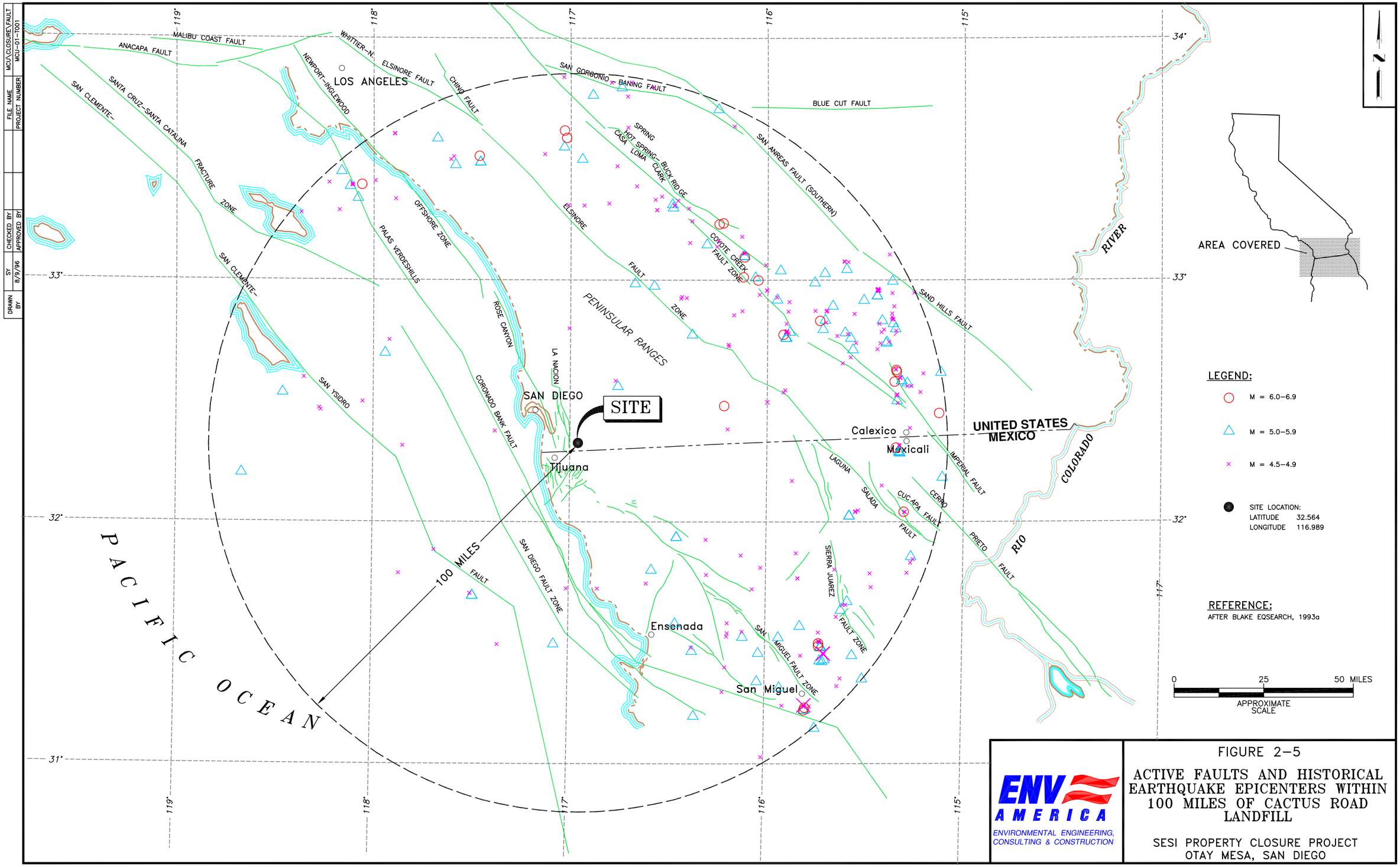
ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2–4

GEOLOGIC CROSS–SECTION G'–G"

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	CHECKED BY			FILE NAME	MCU\CLOSURE\FAULT
SY				PROJECT NUMBER	MCU-01-T001
8/9/96	APPROVED BY				



ENV AMERICA
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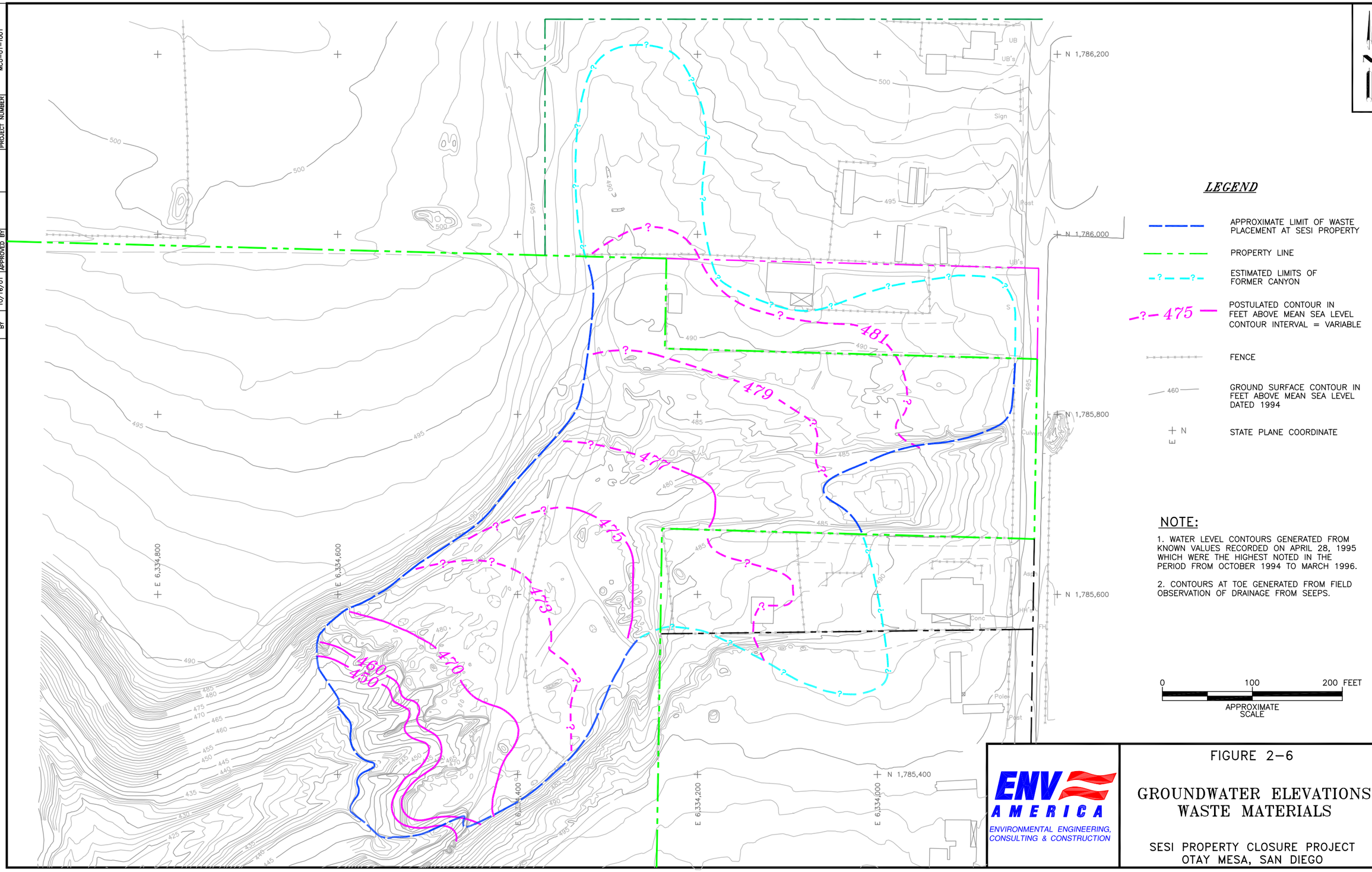
FIGURE 2-5

ACTIVE FAULTS AND HISTORICAL EARTHQUAKE EPICENTERS WITHIN 100 MILES OF CACTUS ROAD LANDFILL

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	DP	CHECKED BY		FILE NAME	MCU\CLOSURE\GW-WASTE
	10/16/01	APPROVED BY		PROJECT NUMBER	MCU-01-T001



LEGEND

- APPROXIMATE LIMIT OF WASTE PLACEMENT AT SESI PROPERTY
- PROPERTY LINE
- ESTIMATED LIMITS OF FORMER CANYON
- POSTULATED CONTOUR IN FEET ABOVE MEAN SEA LEVEL CONTOUR INTERVAL = VARIABLE
- FENCE
- 460 — GROUND SURFACE CONTOUR IN FEET ABOVE MEAN SEA LEVEL DATED 1994
- N / E — STATE PLANE COORDINATE

NOTE:

1. WATER LEVEL CONTOURS GENERATED FROM KNOWN VALUES RECORDED ON APRIL 28, 1995 WHICH WERE THE HIGHEST NOTED IN THE PERIOD FROM OCTOBER 1994 TO MARCH 1996.

2. CONTOURS AT TOE GENERATED FROM FIELD OBSERVATION OF DRAINAGE FROM SEEPS.

0 100 200 FEET

APPROXIMATE SCALE

ENV AMERICA

ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2-6

GROUNDWATER ELEVATIONS WASTE MATERIALS

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO

DRAWN BY	DP	CHECKED BY		FILE NAME	MCU\T01\CLOSURE\GW-OTAY
	10/16/01	APPROVED BY		PROJECT NUMBER	MCU-01-T001

N

LEGEND

- APPROXIMATE LIMIT OF WASTE PLACEMENT AT SESI PROPERTY
- PROPERTY LINE
- ESTIMATED LIMITS OF FORMER CANYON
- 475 — GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
- FENCE
- 460 — GROUND SURFACE CONTOUR IN FEET ABOVE MEAN SEA LEVEL DATED 1994
- N / E — STATE PLANE COORDINATE

NOTE:

GROUNDWATER SURFACE DEPICTED IS FOR THE MAXIMUM RECORDED WATER LEVELS FROM DECEMBER, 1994 TO MARCH, 1996, WHICH WERE MEASURED ON APRIL 28, 1996.

0 100 200 FEET

APPROXIMATE SCALE

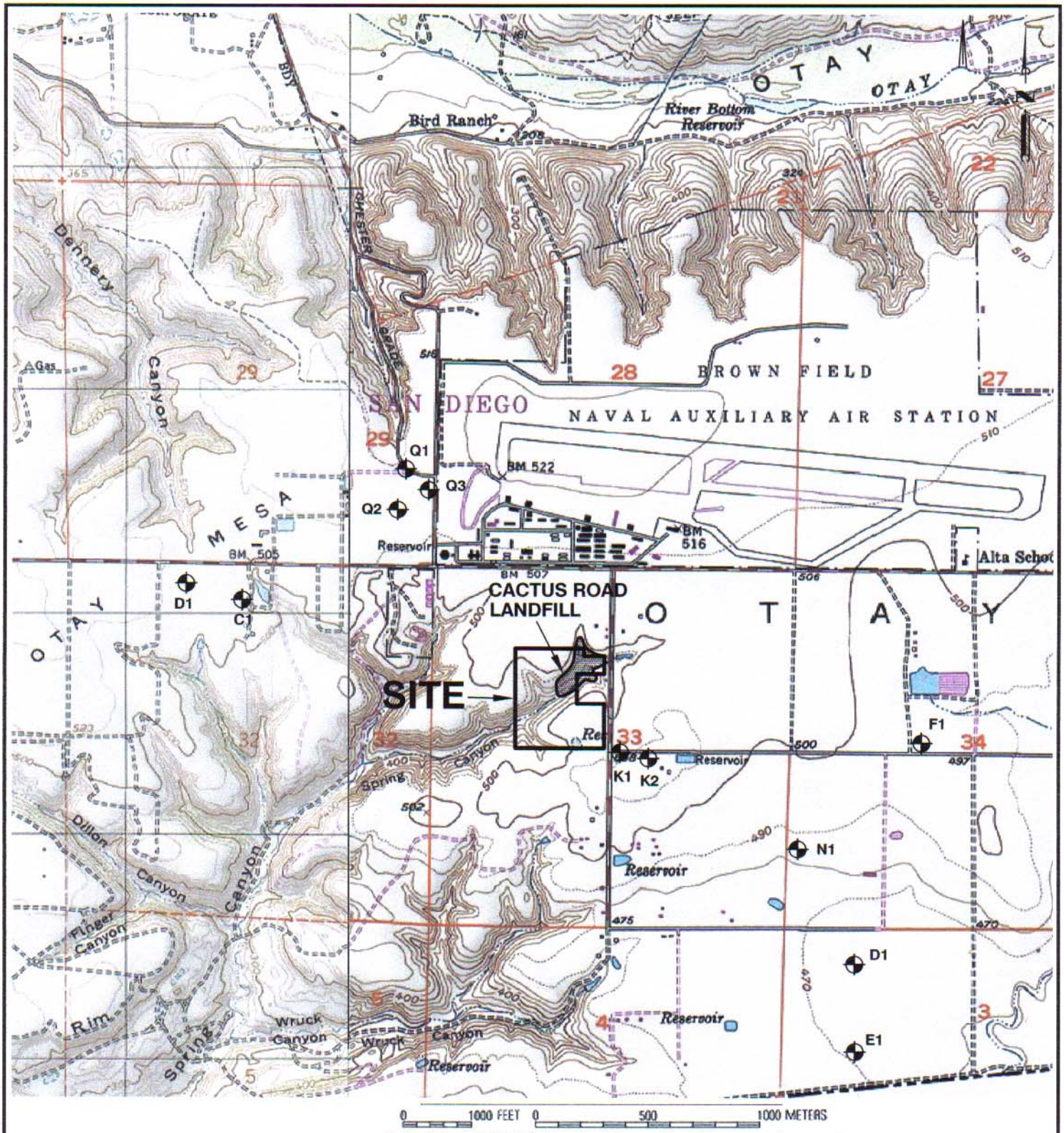
ENV AMERICA

ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2-7

GROUNDWATER ELEVATIONS UPPER OTAY FORMATION

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



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DATE SOURCE:

DEPARTMENT OF WATER RESOURCES SOUTHERN DISTRICT
SEE TABLE 3-1

REFERENCE:

7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAPS OF:
– IMPERIAL BEACH, CALIFORNIA – BAJA CALIFORNIA NORTE, DATED 1967, PHOTOREVISED 1975.
– OTAY MESA, CALIFORNIA, DATED 1955, PHOTOREVISED 1971, PHOTO INSPECTED, 1975.
ORIGINAL SCALE ON BOTH MAPS: 1 INCH = 2,000 FEET.

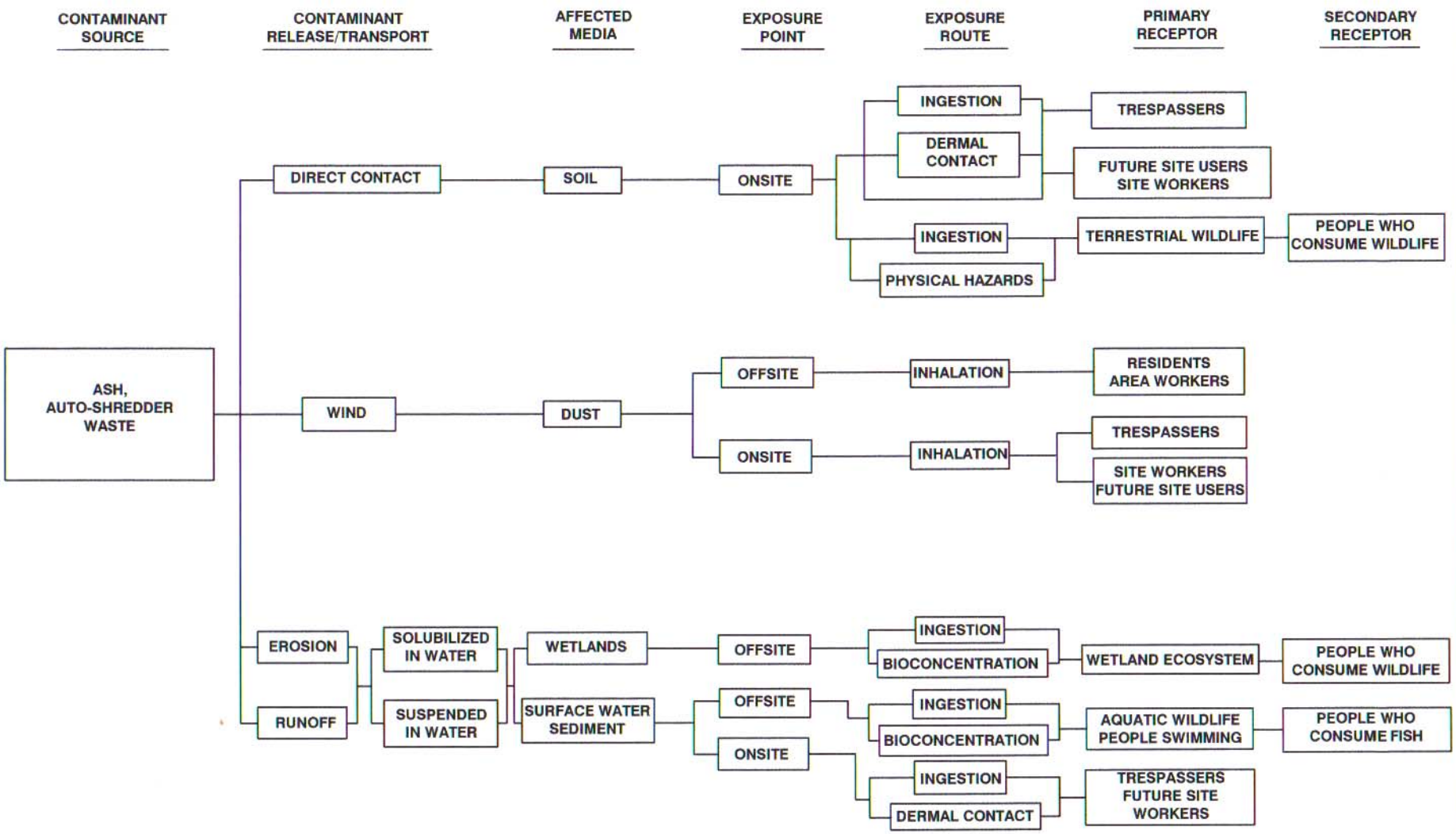
DRAWN BY	DP 11/11/98	CHECKED BY APPROVED BY			FILE NAME PROJECT NUMBER	WELLMAP MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 2-8

WATER WELL LOCATION MAP

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



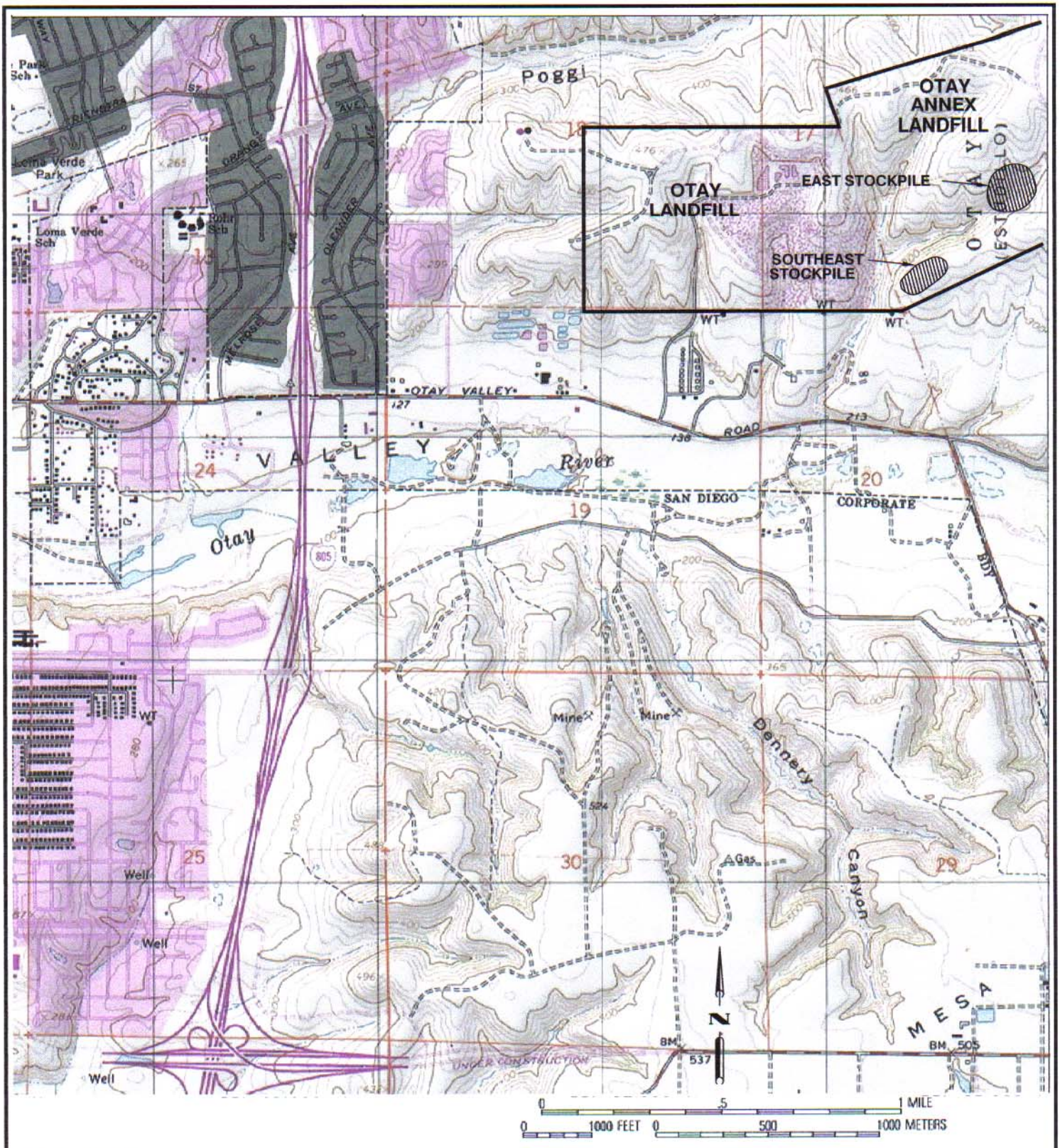
DRAWN BY	DP	CHECKED BY			FILE NAME	CONC SIRTE MODEL
	11/11/98	APPROVED BY			PROJECT NUMBER	MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 3-1

CONCEPTUAL SITE MODEL

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



DATE SOURCE:
DEPARTMENT OF WATER RESOURCES SOUTHERN DISTRICT
SEE TABLE 3-1

REFERENCE:
7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAPS OF:
– IMPERIAL BEACH, CALIFORNIA – BAJA CALIFORNIA NORTE, DATED 1967, PHOTOREVISED 1975.
– OTAY MESA, CALIFORNIA, DATED 1955, PHOTOREVISED 1971, PHOTO INSPECTED, 1975.
ORIGINAL SCALE ON BOTH MAPS: 1 INCH = 2,000 FEET.

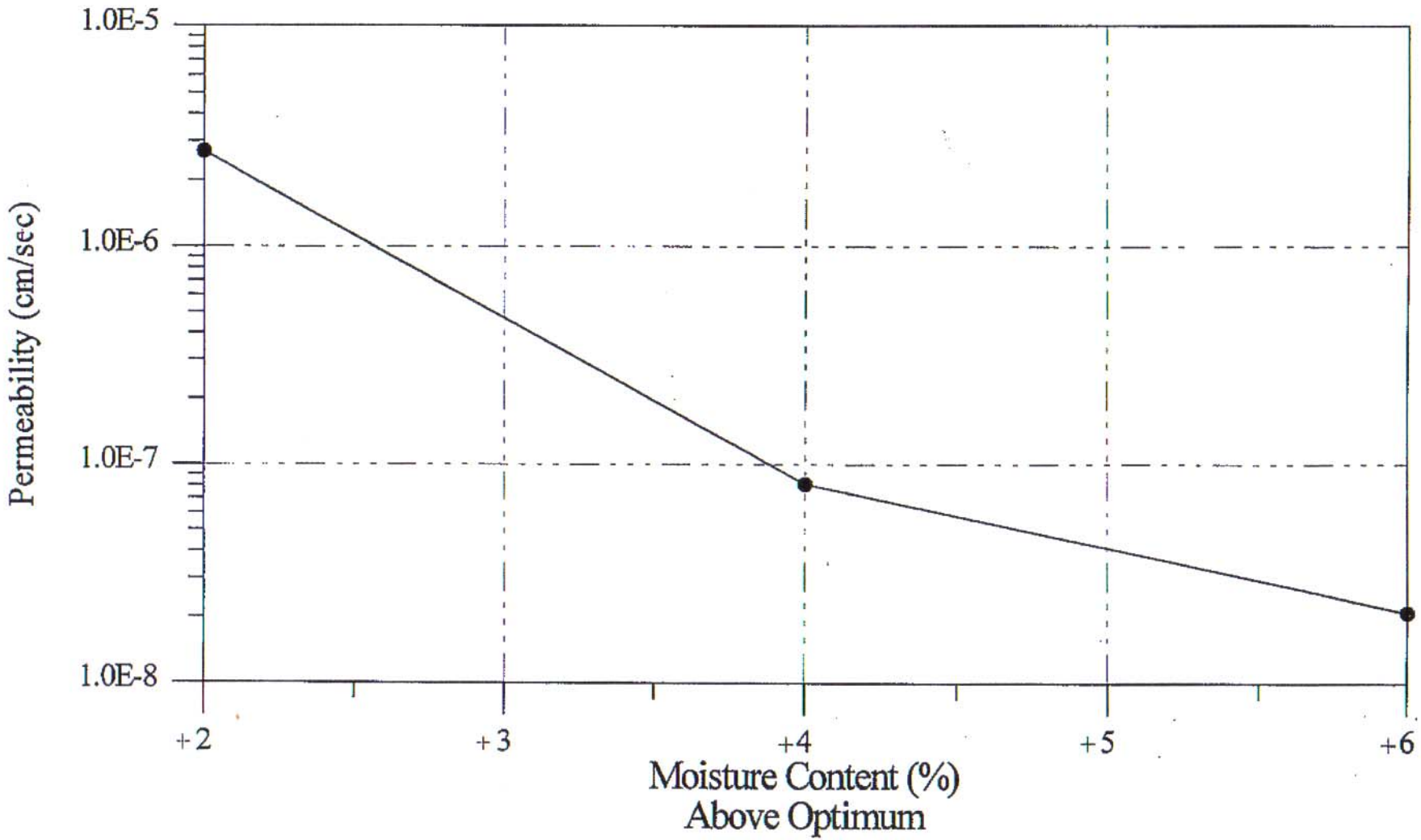
DRAWN BY	DP	CHECKED BY			FILE NAME	WELLMAP
	11/11/98	APPROVED BY			PROJECT NUMBER	MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 8-1

OTAY ANNEX STOCKPILE LOCATION

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO



DRAWN BY	DP 11/11/98	CHECKED BY APPROVED BY			FILE NAME PROJECT NUMBER	PERMEABILITY VERSUS MCU01T001.210

ENV AMERICA
ENVIRONMENTAL ENGINEERING, CONSULTING & CONSTRUCTION

FIGURE 8-2

PERMEABILITY VERSUS MOISTURE CONTENT

SESI PROPERTY CLOSURE PROJECT
OTAY MESA, SAN DIEGO